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INCORPORATION OF CUSTOMER NEEDS IN THE EARLY INNOVATION STAGE OF THE PRODUCT DEVELOPMENT CYCLE FOR AN INNOVATIVE 'CAR PARKING' SMARTPHONE APP

A Master's Thesis submitted for the degree of
"Master of Business Administration"

supervised by
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Graz. September 5, 2016

Affidavit

I, **STEFAN ROTTENSTEINER**, hereby declare

1. that I am the sole author of the present Master's Thesis, "INCORPORATION OF CUSTOMER NEEDS IN THE EARLY INNOVATION STAGE OF THE PRODUCT DEVELOPMENT CYCLE FOR AN INNOVATIVE 'CAR PARKING' SMARTPHONE APP", 68 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 05.09.2016

Signature

ACKNOWLEDGEMENT

I would like to express my gratitude to my supervisor Christoph H. Wecht for the useful comments, remarks and engagement through the learning process of this master's thesis. Furthermore, I would like to thank my loved ones, who have supported me throughout the entire process, both by keeping me harmonious and helping me putting pieces together. I will be grateful forever for your love.

ABSTRACT

With increasing urbanization and traffic volume that can be observed nearly daily in our cities around the world, the parking situation is getting worse and cause stress, anger and a loss of time for parking lot seekers out there.

The goal of the thesis is to identify the key factors that increase the innovation ability of an enterprise, especially for a start-up company with the goal to develop a car parking smart phone app that makes parking as easy as it is.

In order to do so the thesis exemplifies a case study of an innovative pioneer company and turns the gained insights into a recommendation of action which in turn helps the start-up to achieve innovation ability and thus economic success.

The first key to this innovation ability can be seen in the early phase of the innovation process. This phase, also called the fuzzy front end of innovation, involves the highest leverage for product success later on. The second key to an increased innovation ability can be seen in the integration of customers directly into the innovation process.

In the course of the thesis this two key elements of innovation success were investigated in very detail. Those key elements can be seen as a guideline for companies in order to increase their innovation success and thus their corporate success too.

In future it is very likely that customer integration into the early innovation process becomes more and more important also for companies in different businesses than the mobile app development.

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1 INTRODUCTION

This introduction serves to provide the reader with detailed information about the motivation and reasons behind writing this thesis. After describing the initial situation, the introduction presents the objectives of the thesis and the research approach in order to achieve these objectives. The chapter ends with the presentation of the thesis structure.

1.1 Motivation

Nowadays innovation is of highest strategic relevance in most industries, because innovation and the development of new and innovative products is seen as a key factor that engages economic growth and ensures competitive advantage. The key to this innovation ability can be seen in both the early innovation phase of innovation and the customer integration into the innovation process (Gassmann & Schweitzer, 2014, p. v). Both aspects will be described in great detail in the course of this thesis.

The first key to innovation ability can be seen in the early phase of innovation. This phase, also called the fuzzy front end of innovation, involves the highest leverage for product success later on. The words of an experienced project manager accurately describe the fuzzy front end, *"Tell me how the project starts, and I'll tell you how it will end."* (Gassmann & Schweitzer, 2014, p. v). Nevertheless, most managers do not focus their attention on this critical phase of product development. The reasons for this can be found in the fact that later product development phases are much more structured, and thus most managers feel more comfortable in such a well-organized and structured environment (Gassmann & Schweitzer, 2014, p. v).

The second key to innovation ability can be seen in the direct integration of customers in the innovation process. One of the reasons why nowadays customer integration becomes more and more important can be seen in the continuously changing markets. The time intervals in which the market requests new and innovative products are getting shorter and shorter. Hardly any company can fulfil these requirements on its own. Thus, pioneer companies such as Henkel started to react and integrate their customers in the product development process.

1.2 Initial Situation

In the course of this thesis, these two key elements of innovation success will be integrated into the development of an innovative car parking app, and thus lead to increased success and acceptance on the market after product launch. Beforehand, the innovative idea behind the smartphone parking app shall be described on the next pages.

With increasing urbanization and the daily traffic volume that can be observed in cities around the world, the parking situation is getting worse and causes stress, anger and a loss of time for parking lot seekers. Thus, the time is ripe for an innovative, new and exciting method that could revolutionize the parking situation in our cities. On the one hand, more and more vehicles drive through cities, which costs urban dwellers hours looking for a parking space, while, on the other hand, given parking space is limited. As a result of this, parking space has become a highly desired resource in many conurbations – a resource that is not limited to public parking garages and public car parking places, but includes private parking spaces and private carports that also need to be considered when talking about total available parking space.

Thus, a smart phone app that is able to offer its users access to the total available parking space is striven for by the inhabitants of urban centres. Whenever and wherever users of such a smartphone app want to park, an intelligent algorithm recognizes their geographical position and calculates the fastest route to a free parking lot right next to their destination. With the developed algorithm, users can be certain that, just in time of arriving at their desired destination, the parking lot will become free. In order to achieve this, the app requires two users - one who is looking for a free parking lot (user A) and one who intends to leave a parking lot (user B). Once the algorithm identifies a match, both users are guided through the transaction. The user looking for a parking lot (user A) gets directions; the user occupying the parking lot (user B) gets the information about the expected arrival time. As soon as user A arrives, he take over the parking lot of user B. User B claims a service fee from user A.

After installing the app, users need to enter data like maximal distance between parking lot and target destination, maximum fee user A is willing to pay and the minimum fee user B charges. These filters are applied to the search query by an intelligent algorithm to then offer the best match.

Thereby, the algorithm does not necessarily guide the user to a public parking area. In particular, it is very likely that just next to the destination parking space another private parking space is not occupied by its owner. That is, the algorithm attempts to find the best match of ‘distance from your destination’ and ‘overall parking fee’ in order to make parking as easy as possible.

1.3 Objective

The objective of this thesis is to develop a method that can be applied during the development phase of the app described above in order to increase market acceptance and to fulfil customers’ needs. This chapter aims to describe the specific focus of this thesis and to identify the main research questions. This chapter is also intended to point out the boundaries of the present research project.

1.3.1 Focus

The focus of this thesis is the development of a concept that structures the fuzzy front end of innovation, on the one hand, and enables the integration of customers into the product development process, on the other. This concept will be adapted to find application in the early-development phase of a smart phone app carried out by a start-up company.

After presenting the state-of-the-art information, in the course of this thesis, the innovation process and customer integration will be evaluated in a case study. Based on the insights gained, the scope of action is defined in order to develop the above-mentioned concept.

The goal of this thesis is to analyse all activities in the fuzzy front end of innovation and to identify which method suits best to structure it. Therefore, literature research on the common models for structuring the fuzzy front end is needed.

With regard to customer integration, the goal of this master thesis it to identify and to describe the various roles a customer can take over in the product development phase. Based on that, a specific competency profile of the customer will be developed that helps the integrating company to identify the right customers. In addition, the thesis describes and identifies the right moment of time for customer integration.

1.3.2 Main research question

The research activities are based on the following two main research questions:

1. How can the fuzzy front end of innovation be structured in order not to hinder creativity due to over-regulation?
2. How are customers integrated into the early innovation process of product development and which roles can customers play?

1.3.3 Boundaries

Both main activity fields, the structuring of the fuzzy front end and the customer integration, focus on the beginning of the innovation process and not on the product development phase. It is not scope of the thesis to develop the parking app or the mentioned algorithms itself.

The object of analysis can be seen in the innovation process. Customer integration takes a secondary role within the innovation process. All recommendations for action are presented from the perspective of companies that integrate customers as an external source into the innovation process.

As the smartphone app focuses on end customers and users, all methods and tools presented are suited for the business-to-consumer (B2C) business. Approaches that are suitable for business-to-business (B2B) business may differ in their characteristics from the approaches shown in this thesis.

1.4 Research approach

As the answering of the two main research questions is complex and cannot be done without providing additional knowledge, the first step in the overall research approach is to present detailed information about innovation in general and state-of-the-art information from the specific research areas. State-of-the-art information presents the state of knowledge in the areas of structuring the fuzzy front end as well as customer integration. The basis for this information forms the theoretical background that will help the reader to understand the term innovation in general. Based on the theoretical background and the state-of-the-art information, two hypotheses were formulated. The goal of this thesis is to confirm or reject the veracity of these two hypotheses. In order to do so, a research approach based on a case study was chosen. The case study identifies in great detail how customer integration and the structuring of the innovation process is realized in a company that takes over a pioneer role in

innovation management. Based on the insight of the case study, the hypotheses were tested for veracity. Furthermore, the insights of the case study were used to develop a concept for implementation in the product development of mentioned smartphone app.

1.5 Structure of the thesis

The thesis encompasses, in total, seven chapters. The first chapter presents the relevance of the topic and the initial situation. Based on that, the subsequent part describes the goals of this thesis as well as the main research questions. The way of answering these questions is described in the research approach. Furthermore, chapter one contains the boundaries of the thesis.

The second chapter provides the reader with information about the fundamental basics of innovation management. It starts with the explanation of the term innovation itself, taking into account the basics of innovation management and explains areas of activity in innovation management. The second chapter also describes the innovation process itself and increases the understanding of the reader as to why innovation processes are needed in order to increase the innovation success of a company. The section finishes off with details of the product life cycle model and the market pull/technology push strategy.

Chapter three presents state-of-the-art information from the research areas of structuring the fuzzy front end of innovation and integrating customers in the early product development process. The chapter starts with an explanation of the reasons for the fuzziness of the early innovation process and continues with a description of activities that are usually carried out at the fuzzy front end. In order to manage these activities in a structured and controlled way, the next section of chapter three describes three process models used to structure the fuzzy front end of the innovation process. This is followed by a description of the characterizing elements of the innovation process, which is needed to provide a proper understanding of managing the innovation process. Furthermore, chapter three provides state-of-the-art information regarding customer integration, distinguishing between the two types of information a customer can provide, and explains the differences between direct and indirect customer integration to then describe the goals a company strives for integrating customers in their product development process. Finally, chapter 3 transforms the main research question into a hypothesis.

Based on the fundamental theoretical knowledge provided in the previous two chapters, chapter four analyses the customer integration and the structure of the innovation process exemplifying the case study of Henkel. Henkel is known for playing a pioneer role in innovation management and thus is the most adequate for the case study.

Chapter five discusses the insights gained from the case study and, based on these insights, develops recommendation for action. Furthermore, it contains evidence for the hypothesis.

Chapter six develops a concept for implementation of the knowledge gained in the early development phase of a smartphone app that simplifies the car parking situation in urban centres. In the same way as the entire thesis focuses on the two main research areas, chapter six is also focussed on the implementation of the concept in the same research areas. They are the structuring of the fuzzy front end of innovation and support the integration of customers in the early innovation process.

Finally, chapter seven presents a short summary of the most important results and provides an outlook on future applications.

Fig. 1 illustrates the structure of the entire thesis.

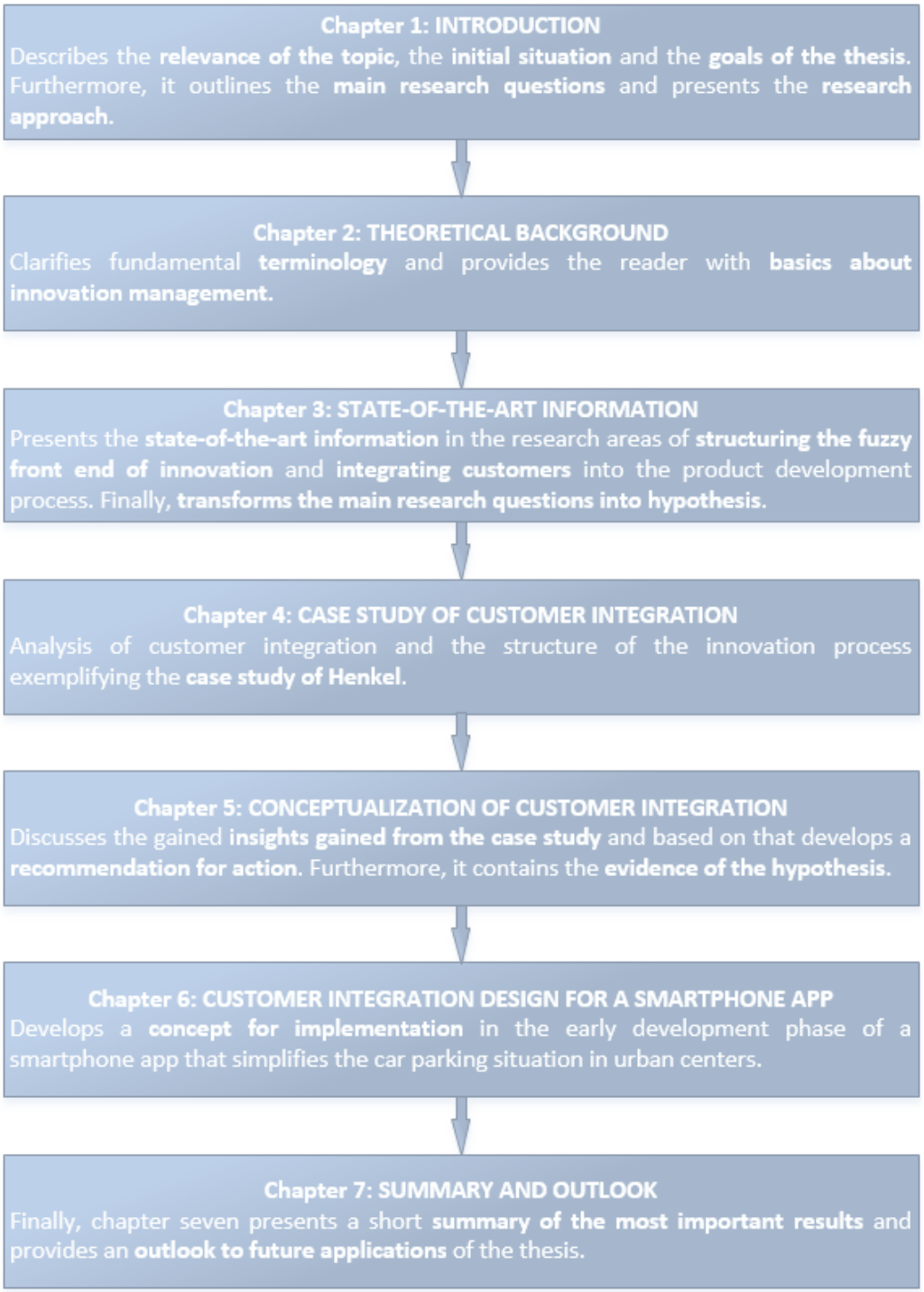

Fig. 1 Structure of the thesis

2 THEORETICAL BACKGROUND

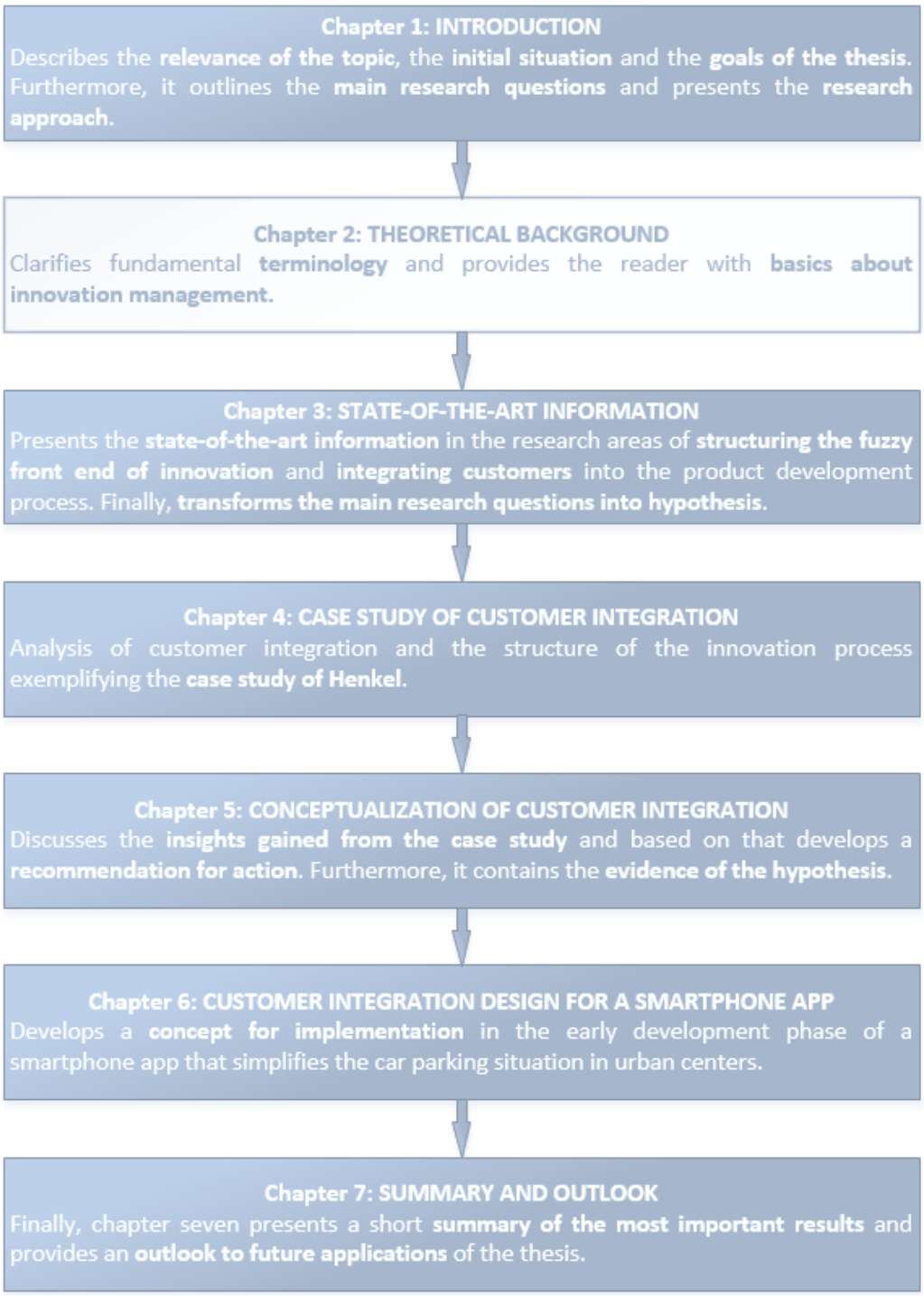

Fig. 2 Structure of the thesis

The following chapter is intended to ensure readers have a common understanding by transferring knowledge about the basics of innovation management, areas of activity in innovation management and about the innovation process itself.

Furthermore, the typical product life cycle will be presented, but the first step is to determine what is meant by the term innovation.

2.1 Terminology

Searching dictionary entries, there is no common definition for the term “innovation”. However, there are a couple of appropriate statements describing “innovation”. For example, Schumpeter, in 1961, described the term innovation as the creation of new sources for achieving customer satisfaction. In a more detailed perspective, he described innovations as a competitive advantage in order to gain economic success (Eckehard, 2009, p. 87).

Innovations (from Latin “innovatio” = renewal, modification, transformation) represent a central driving force in the emergence of new companies, but also a reason for failure of existing companies. Thus, innovations are the source and the driver of economic growth. However, it’s innovations that can cause high instability in our economic systems (Schuh, 2012, p. 1).

Invention is the beginning of each innovation. An invention is an idea by which a product or a process can be differentiated from the state of the art. Only in case an invention or idea gets developed to a certain level of product maturity and the product is launched to the market do we talk about an innovation (Schuh, 2012, p. 2).

Innovations can be distinguished by an innovation object, which can be a product or a process. In case the innovation object is a product, the innovation is called product innovation. In case the innovation object is a process, the innovation is called a process innovation (Wecht, 2006, p. 5). The focus of this thesis is on product innovations only. In many cases, the two types of innovations determine each other. For example, product innovations often lead to small modifications in the production process, marketing & sales of the products or in the various areas of services (Schuh, 2012, p. 2).

Furthermore, innovations can be separated by the degree of innovation to which the distinction is made between radical innovations, incremental innovations and disruptive innovations. Radical innovations are characterised by a high degree of innovation, while incremental innovations are characterised by a low degree of innovation (Wecht, 2006, p. 6). Radical innovations describe major changes, which were usually followed by the introduction of new technologies that have the power to cause a huge impact on markets. Radical innovations typically include high risk compared to incremental innovations. Disruptive innovations, on the other hand, are

characterized not by technological breakthroughs, but by that they can create a break on the market by replacing an existing technology (Dornberger & Suvelza, 2012, p. 45).

2.2 Basics of Innovation Management

The discipline of innovation management deals with the systematic planning, control and monitoring of the activities linked to the transfer of ideas to innovations inside an organisation. The management of innovations focuses on products, services, production processes, organisational structures and management processes. Thus, innovation management represents a core discipline inside an organisation in order to ensure the competitiveness of a firm (Schuh, 2012, p. 2).

Particularly in saturated markets, as we can find them for the most products in the triad (= a cluster of the three biggest economies in the world that consists of the NAFTA, the EU and the ASEAN + 3), overcapacity, globalisation, pricing pressure and multiplicity of provision rule day-to-day business. This leads to a dramatic decrease of the product life cycles on the one hand, and, on the other hand, has led to customers being separated into smaller market segments. Vice versa, a higher number of market segments with narrow boundaries lead to an increased product variety with smaller quantities per each type. The result is clear: R&D departments face huge costs for research and development in order to cover enormous product diversity (Schuh, 2012, p. 3).

But not only external challenges like those mentioned above require a well-integrated innovation management culture inside a company. Innovation management faces the challenge of finding the right balance between creativity and structure. Giving room for flexibility and creativity is a must-have in the innovation process; on the other hand, compliance with standards, regulations and norms is essential, too, for achieving economic success with developed products (Schuh, 2012, p. 3).

Apart from these internal and external challenges, innovation management also has to deal with overcoming resistances, because innovations are often seen as a disturbance or nuisance. These resistances can have their origin either company-internally, company-externally or are caused by authorities or against protest groups (Schuh, 2012, p. 3). It’s the task of an innovation manager to find ways to overcome these resistances and to keep the focus on the innovation and the added value for the customer.

The basis and the motivation for innovation management is the strict focus on customers' interests throughout the entire innovation process. Thereby, the evaluation standard of innovation management systems is the added value for the customer. Thus, detailed knowledge about customers' needs are absolutely essential, especially in the early phase of the innovation process, in order to match the R&D activities and goals with the expectations of the customers (Schuh, 2012, p. 4).

2.3 Areas of Activity in Innovation Management

The ability to innovate depends on target-orientated and efficient innovation management inside a company. For this purpose, an innovation management system needs to act in all business areas. For example, the strategic orientation of a company requires, apart from the correct innovation programmes, proper innovation organisation as well as management behaviour that is open-minded to innovation. Only by considering these aspects, innovation culture inside a company can be achieved and thus enable innovation (Schuh, 2012, p. 5).

To sum up, there are four areas of activity in innovation management, which are also shown in Fig. 3, and which were described in more detail in the section below. The four areas are:

- Innovation Programme
- Innovation Organisation
- Management Behaviour
- Innovation Culture

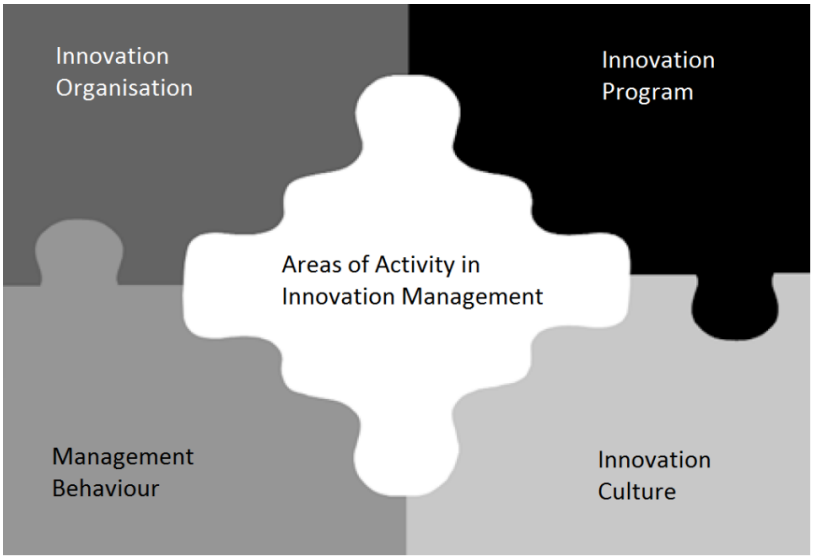

Fig. 3 Areas of Activity in Innovation Management (Schuh, 2012, p. 5).

The **innovation organisation** represents a framework to plan and implement innovation programmes. The goal of the innovation organisation is the creation of common structures that enable an optimal ability to innovate (Schuh, 2012, p. 6).

Innovation programmes are derived from the corporate policy and provide the strategic direction of future innovations. The primary task of innovation programmes is to strengthen and to extend the own position on the market (Schuh, 2012, p. 7).

The third area of activity is the **management behaviour**. The goal is to increase the understanding of employees for the importance of innovation and their innovative capability (Schuh, 2012, p. 7).

The **innovation culture** of a corporation is essential for the successful implementation of innovation processes and innovation projects. An indicator for good innovation culture are target-orientated procedures. Only in case innovation goals and strategies are represented and communicated in a clear way can an innovation team search for proper solutions (Schuh, 2012, p. 8)

2.4 The Innovation Process

It is challenging to develop a new product based on a simple product idea and to launch this product successfully on the market. It gets even more difficult if you want to launch the product in a fast and reliable way. To solve such a problem and to find the best possible solution, a systematic approach and a high degree of creativity are required. The goal of an innovation process is to provide the framework to confront this challenge (Wördenweber & Wickord, 2008, p. 154).

As the competitiveness of a corporation depends significantly on its ability to develop innovative products and to launch them quicker on the market than its competitors, the investigation of the innovation process is of utmost importance. The innovation process can be applied because research has shown that various development tasks show recurring characteristics. Furthermore, research has shown that there is a systematic behaviour behind a successful product development – without association to the task or the academic discipline (Wördenweber & Wickord, 2008, p. 155).

However, the innovation process is heavily dependent upon the industry and the product. For example, an innovation process in a technology-based firm can be completely different from an innovation process in a consumer goods company (Wördenweber & Wickord, 2008, p. 161).

The typical innovation process is divided into a series of phases, which begin with the product idea and continues with the phases planning, development and manufacturing. Fig. 4 represents the stage-gate innovation process, which is typical for products in the automobile industry. The stage-gate process distinguishes between gates and milestones (Wördenweber & Wickord, 2008, p. 162).

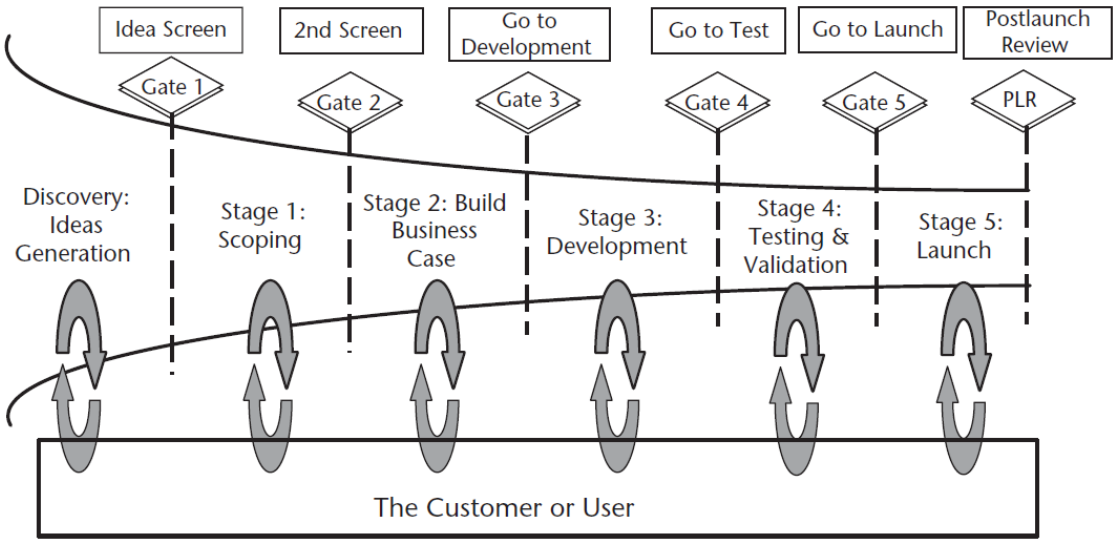

Fig. 4 Stage-Gate-Process (Kahn, Kay, Slotegraaf, & Uban, 2013, p. 29).

Gates typically represent a fixed point in time where an innovation team or a project team measures the degree of accomplishment as well as project costs and project time. After each gate, the project team together decides on the next project steps. The milestones, on the other hand, which represent events during the project phase, are linked to the starting or ending point of processes (Wördenweber & Wickord, 2008, p. 162). A detailed description of the stage-gate process model follows in chapter 3.2.1.1.

2.5 The Product and Technology Life Cycle

The following chapter is used to describe the product life cycle model. The basic idea of this model is to illustrate the limited lifetime of a product or technology on the market and to point out the course of sales and profit (Dornberger & Suvelza, 2012, p. 31). Fig. 5 depicts the product life cycle model.

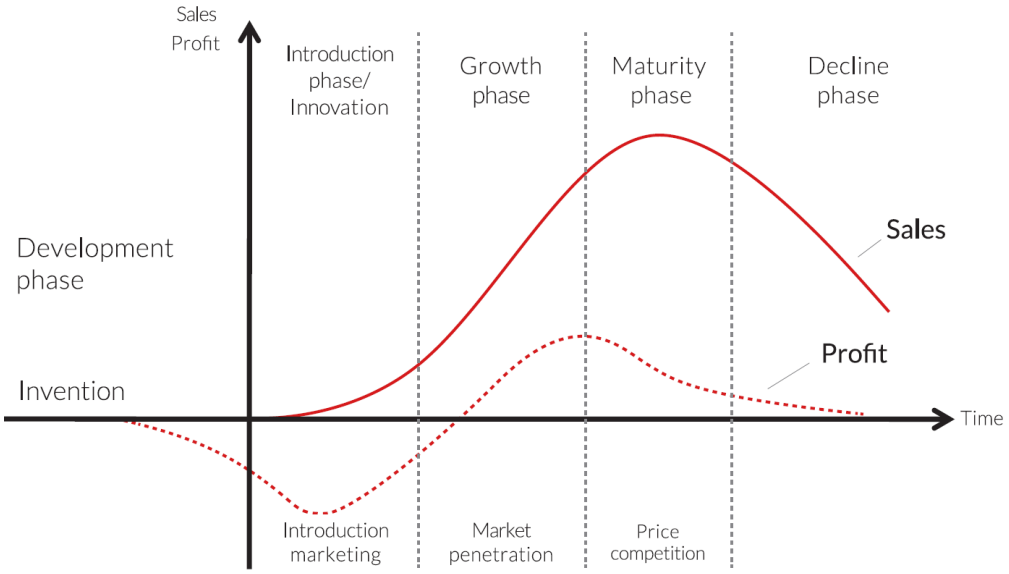

Fig. 5 Product Life Cycle Model (Dornberger & Suvelza, 2012, p. 31).

The product life cycle divides the lifetime of a product or a technology on the market in the following four phases (Dornberger & Suvelza, 2012, p. 31):

- introduction phase
- growth phase
- maturity phase
- decline phase

The **introduction phase** is characterised by the market introduction of a new product. Typically, the previous development phase causes costs for the company, and thus the profit of a novelty starts with a negative sign. Due to increased marketing activities and low sales volumes at the beginning, the profit turns even more negative. The **growth phase** is typically followed by a positive transformation of return on investment and typically peaks at the end of the growth phase. Although the sales volume still increases in the **maturity phase** due to tough competition, the profit begins to decline. Finally, in the **declining phase**, sales and profit will decrease (Dornberger & Suvelza, 2012, p. 31).

2.6 Market Pull and Technology Push

There are two different main drivers that lead to a new innovation impulse. The first option is that the innovation impulse is caused by the market; in that case the innovation is called market pull innovation. The second option is that the innovation impulse is based on technology. In that case, the innovation is called technology push innovation (Schuh, 2012, p. 30).

It is typical for the market-pull strategy that the customers' needs form the starting basis. This means that the early development phase is characterised by the identification of latent customer needs. Based on this identification, new products are developed in order to fulfil the customers' needs and to bridge the identified market niche. To sum up, the innovation activities are more service and customer-oriented (Schuh, 2012, p. 30).

The technology-push strategy, on the other hand, focuses on the development of new technologies although there is no demand by the customers. The focus of the technology-push strategy is to invent strategic innovations that have the power to create a new market in the future. The goal of the technology-push strategy is to create new customer needs and thus became independent from changing customer requirements. In the best case, the technology push strategy helps the company to occupy the newly created market segment as a market leader (Schuh, 2012, p. 30).

The following table describes the fundamental characteristics of both strategies (Schuh, 2012, p. 30):

Characteristic	Technology Push	Market Pull
Technological Uncertainty	high	low
R&D Expenses	high	low
R&D Duration	long	short
Market Uncertainty	high	low
Customer Integration	difficult	easy
Innovation Process	chaotic	structured

Table 1 Characteristics of the Market-Pull and the Technology-Push strategy (Schuh, 2012, p. 30).

The table above shows that both strategies in its purest forms are highly contrary to each other and both strategies imply significant risks for the company. Typical risks of the technology-push approach can be seen in the loss of the market focus, while a typical risk of the market-pull approach appears to be too superficial in the technological advantage, which leads to a simple "face lift" of the product rather than an innovation. Thus highly successful innovations are based on a combination of both strategies, the market-pull as well as the technology-push (Schuh, 2012, p. 31).

3 STATE-OF-THE-ART INFORMATION

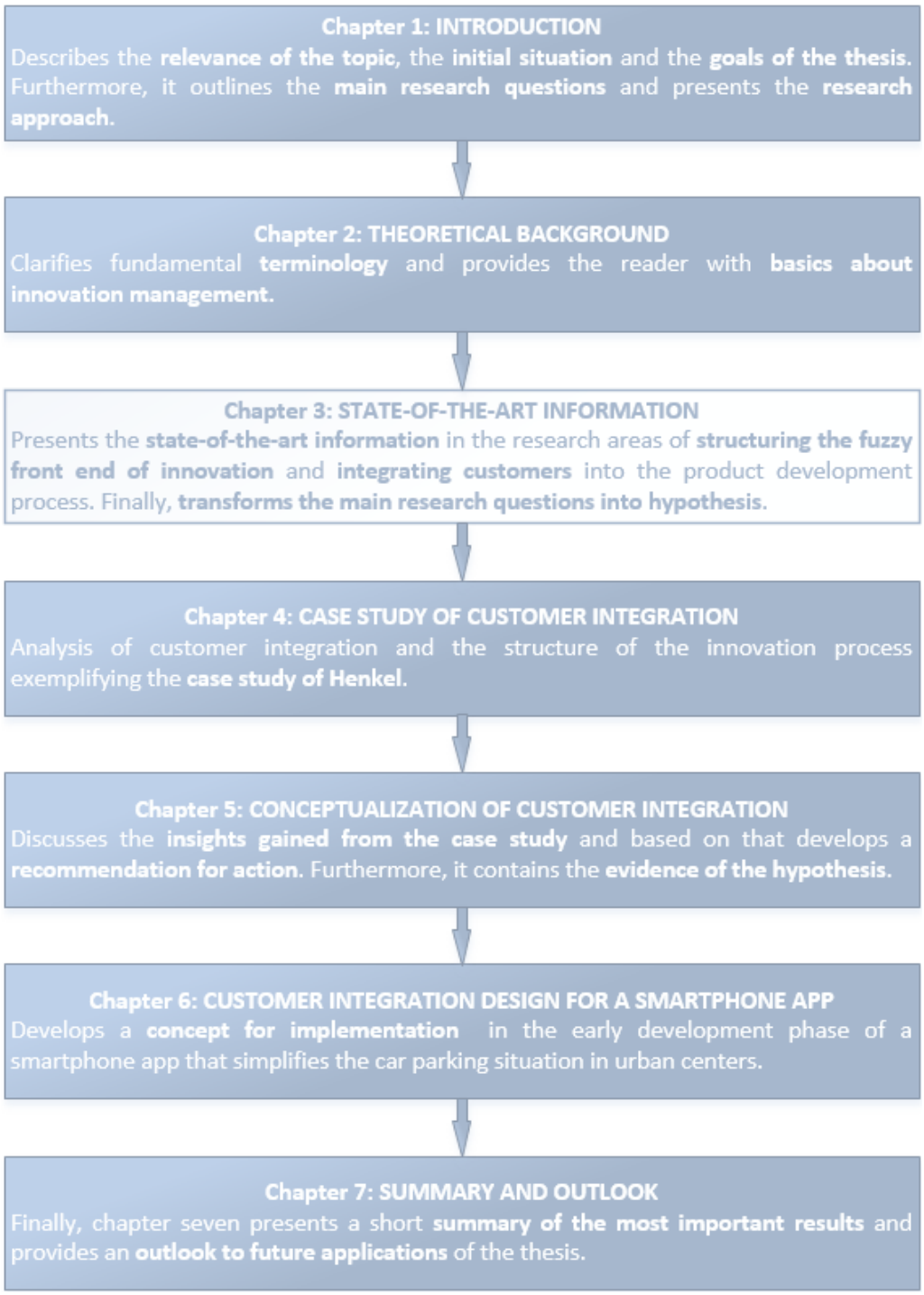

Fig. 6 Structure of the thesis

The subject of customer integration in the early innovation process has been described in the literature from different points of view. As early as at the end of the 1970s, Eric von Hippels published relevant publications in this field (Wecht, 2006, p.

14). Numerous authors and researchers have since investigated the customer integration in the early innovation phase.

The following chapters will sum up the results of these researches and publications and thus provide an overview of the state-of-the-art information.

3.1 The Fuzzy Front End of the Innovation Process

By having a more detailed look at the main innovations of the last years, it becomes clear that there have been a couple of innovations, such as Facebook or the iPhone that have changed our behaviour. However, generally speaking there is a lack of really revolutionary inventions such as those we had the century before with the development of planes, cars and phones, which changed the lives of almost everyone around the globe. Thus it has been criticised that today's innovations are not able to generate as much economic growth as is needed to meet the demands of our growing society. It can therefore be stated that innovation is a key factor of successful companies, and more than important for achieving economic success. As mentioned in a recent CEO survey by IBM, top management and CEO's of the investigated companies see innovation as being of utmost importance (Gassmann & Schweitzer, 2014, p. 3).

However, only a small number of managers focus on the entire innovation process. Most of them were only involved near the end of the innovation process, where procedures are already clear and responsibilities are distributed. In this stable environment, most managers fare well. The early innovation process, on the other hand, is characterised by fuzziness, uncertainty and an environment where the outcome of the process is hard to predict. But it is exactly this early environment where decisions with real leverage are taken – namely the fuzzy front end of innovation (Gassmann & Schweitzer, 2014, p. 4).

Usually, decisions in the early phase of the innovation process are taken with high uncertainty. A common method to reduce this uncertainty is prototyping, either virtual or real. Nevertheless, the risk that customers' needs were not met remained as long as the product had been launched to the market (Gassmann & Schweitzer, 2014, p. 5).

The fuzzy front end is defined as the time span between the birth of a new product idea or the identification of a new opportunity and the point in time where the development of the project starts with serious effort. Fig. 7 represents the ideal innovation process within a company (Gassmann & Schweitzer, 2014, p. 4).

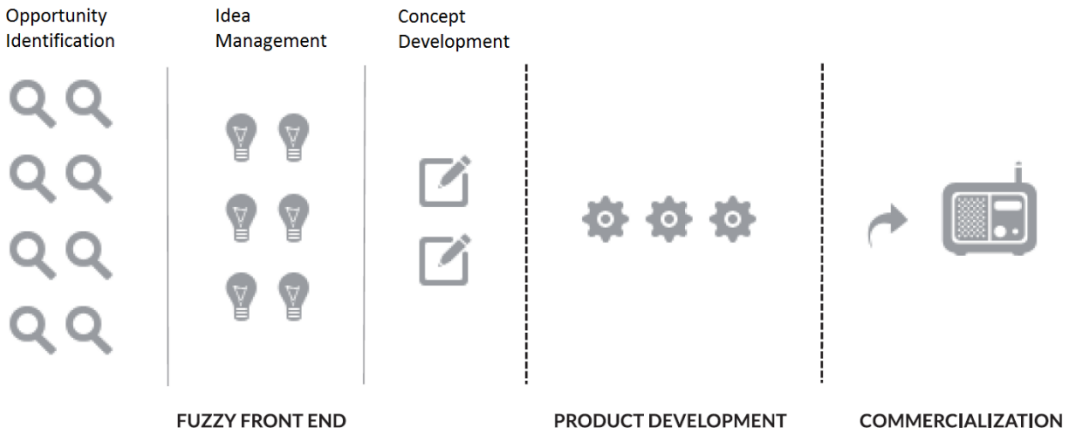

Fig. 7 Ideal innovation process within a company with the fuzzy front end (Dornberger & Suvelza, 2012, p. 20).

The innovation process starts with the identification of opportunities for the company. Once a proper opportunity has been found, the idea management phase is used to search for novelties and to generate creative ideas. In the phase of concept development, the ideas are evaluated and the best ideas are chosen in order to create a development concept. These three phases are summarized as the “Fuzzy Front End of Innovation” (Dornberger & Suvelza, 2012, p. 20).In a complete innovation process, the fuzzy front end is followed by a product development and a commercialisation phase (Dornberger & Suvelza, 2012, p. 20).

3.1.1 Activities at the Fuzzy Front End of Innovation

All actions during the innovation process, between the first appearance of an opportunity and the beginning of the product development, are attributed to the fuzzy front end (Gassmann & Schweitzer, 2014, p. 5). Fig. 8 describes the innovation process and highlights the activities at the fuzzy front end (Herstatt & Verworn, 2001, p. 4).

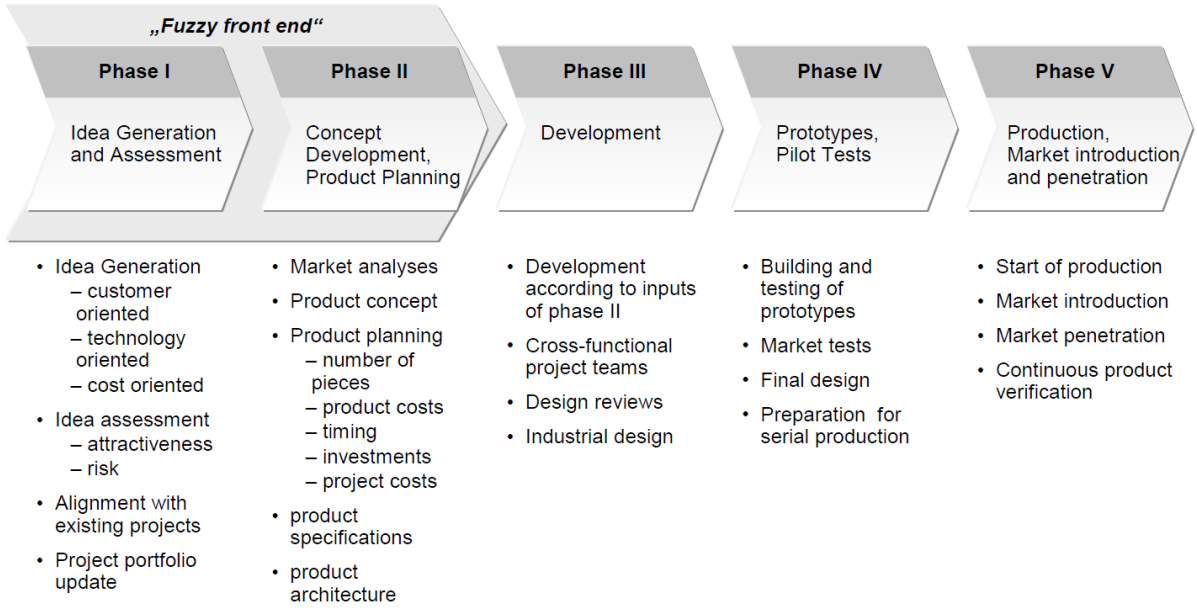

Fig. 8 Activities throughout the innovation process, especially at the fuzzy front end (Herstatt & Verworn, 2001, p. 4).

The **first front end activities** (see phase I in Fig. 8) include the selection of a proper opportunity as well as the screening and evaluation processes. The goal of the early fuzzy front end is to design a product that the customer desires (Gassmann & Schweitzer, 2014, p. 5).

The following citation, which corresponds to the quote of a BMW engineer, describes the first fuzzy front end activities in a perfect way (Gassmann & Schweitzer, 2014, p. 6):

"*Our task is to provide the customer with something that fills the customer with real excitement when he gets it, but that he never knew he was seeking in the first place"*.

In other words, the customer plays an essential role in that early innovation phase, apart from the fact that you cannot simply ask your customer about their expectations. Much more than simply asking about customers' needs has to be done, because usually customers only mention things already known to the engineers (Kahn, Kay, Slotegraaf, & Uban, 2013, p. 215). Thus, the early front end activities are very challenging for the engineers and they need to know the customers better than they know themselves. That implies that early front end engineers, who are in direct contact with the customers, need to identify the implicit wishes and turn them into proper opportunities (Gassmann & Schweitzer, 2014, p. 6).

The **later front end activities,** which are summarized in phase II in Fig. 8, help to specify the chosen opportunities in greater detail. The main activities in phase II are

market analyses, concept development, product planning and specifications. However, the most challenging task is to find and to choose a proper opportunity (Gassmann & Schweitzer, 2014, p. 6).

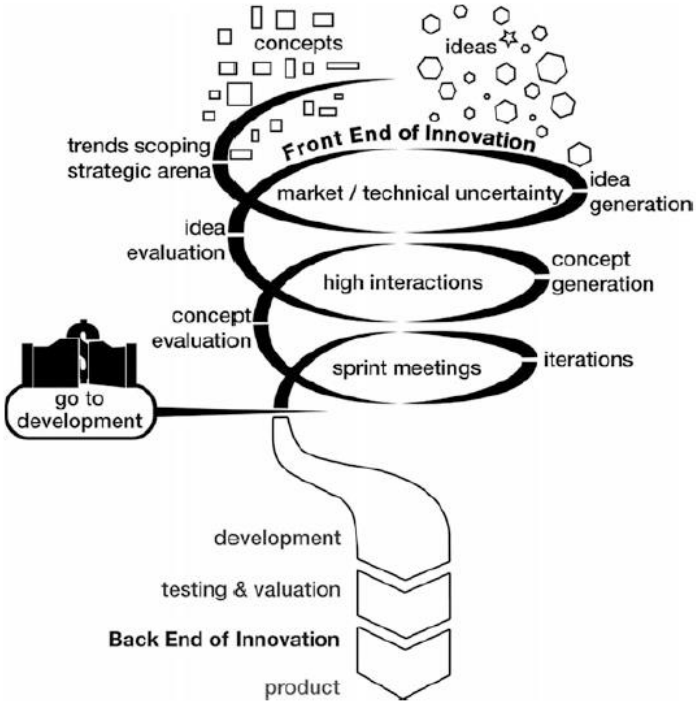

Fig. 9 Activities at the fuzzy front end of innovation (Gassmann & Schweitzer, 2014, p. 7).

Fig. 9 illustrates the activities throughout the innovation process, especially those until the “go to development” point in time. These figures are certainly not valid for every single type of innovation. However, apart from the fact that the duration time as well as the degree of detail is going to vary, the basic activities always remain the same Fig. 10, as well as the words following in this section, were used to describe these recurring activities and the effects on the items cost, influence and information throughout the innovation process. At the very beginning of the innovation process the facts are as follows: there are uncertainties on the market and uncertainties with the technical solution. In the course of time, these uncertainties decrease and, by contrast, the information gained increases. Thus, and this is the reason why proper fuzzy front end management is that important, the cost of change rises dramatically (Gassmann & Schweitzer, 2014, p. 7).

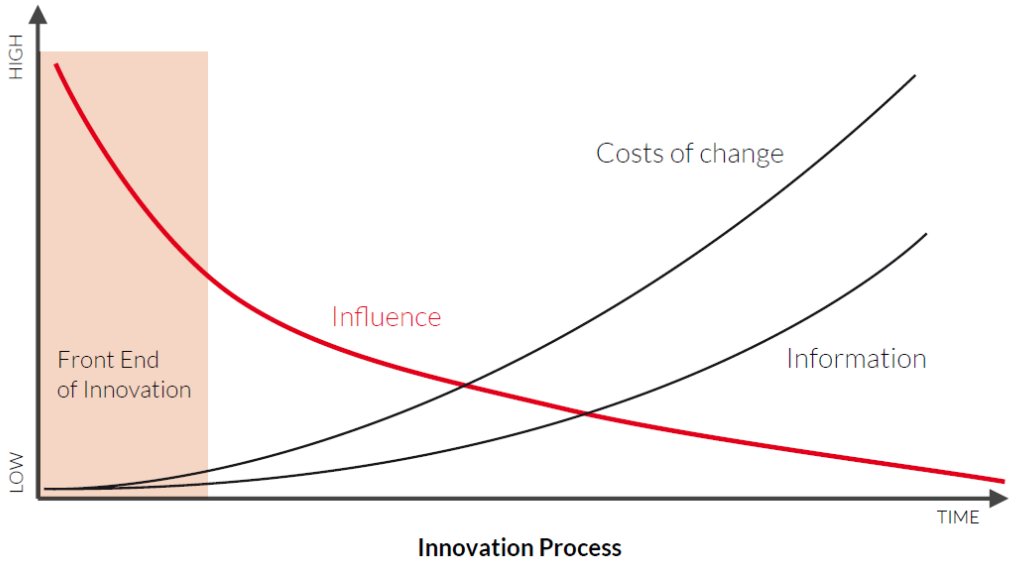

Fig. 10 Influence, cost of changes and information during the innovation process (Dornberger & Suvelza, 2012, p. 97).

Taking into account these three key influencers, it becomes fairly clear that the real leverage of the whole innovation project can be found in the fuzzy front end. Decisions that are taken at the front end have much higher impact on the overall outcome and cause by far lower costs. On the other hand, wrong decisions at the front end have the power to lead to costly deviations from the original innovation goal. This may lead to the assumption that most important decisions – those which are typically taken by at least middle management – are taken also in the fuzzy front end by at least middle management. Unfortunately, this is not the case. In most companies, management is involved in the decisions of an innovation project after it has successfully passed the "go to production" gate. But in this phase, innovation projects start to become expensive. Thus, a proper structuring and management of the fuzzy front end is of vital importance (Gassmann & Schweitzer, 2014, p. 8).

3.2 Structuring the Fuzzy Front End of Innovation

As the front end of the innovation process is characterised to be fuzzy, uncertain and full of risks, it is of vital importance to structure the tasks in order to ensure innovation success and to make the fuzzy front end manageable. Structuring the fuzzy front end is an ongoing balancing act on a fine line between flexibility and creativity on the one hand, and structure and systemization on the other. It is said that too much structure and systemization prevent employees from fulfilling their creativity potential, while too little structure also influences the performance and the outcome of the Fuzzy Front End in a negative way (Gassmann & Schweitzer, 2014, p. 16).

In order to structure the fuzzy front end, process models were used. The following chapter of the thesis is intended to describe characteristics of typically used process models (Gassmann & Schweitzer, 2014, p. 15).

3.2.1 Process Models for Structuring the Fuzzy Front End

The objective of a process model is to divide the front end into phases. Depending on the way the front end is spitted into phases, a distinction can be made between sequential process models and parallel process models (Gassmann & Schweitzer, 2014, p. 16). The following chapter provides more details about frequently used process models.

3.2.1.1 Stage-Gate Process

As a representative of the sequential process model, the Stage-Gate Process Model divides the innovation process into stages. These stages are separated by gates, and each gate is used to take a decision on whether to continue with the entire project or not. The figure below (Fig. 11) illustrates the model with its stages and gates (Gassmann & Schweitzer, 2014, p. 18). The front end itself is divided into three sequential stages, while the remaining stages concern the development process (Kahn, Kay, Slotegraaf, & Uban, 2013, p. 117).

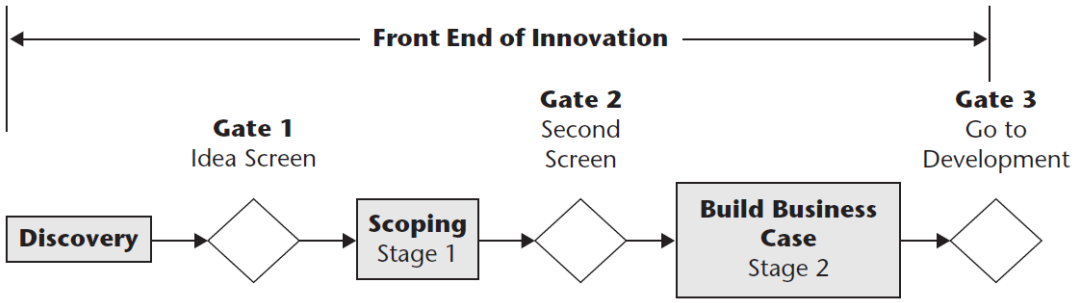

Fig. 11 Stage-gate process (Kahn, Kay, Slotegraaf, & Uban, 2013, p. 117).

The following listing describes the stages and gates of the front end of the process (Gassmann & Schweitzer, 2014, p. 18):

Stage "0": Stage "0" describes the discovery phase, where new ideas are collected. In this stage creativity plays an essential role.

Gate "1": Ideas generated in stage "0" are evaluated afterwards at gate "1". Possible selection criteria are in proper accordance with the company's strategy, the acceptance of the concept/idea on the market, as well as a cross check, if there is a technical solution available for the problem.

Stage "1": After successfully passing gate "1", it is a task of stage "1" to conduct a market analysis and to determine the benefits of the concept/idea in comparison to the existing products available on the market.

Gate "2": Further and more detailed evaluations and screenings take place at gate "2".

Stage "2": Stage "2" focuses on detailed tests (technology, competition and market) and the development of a business plan.

Gate "3": Gate "3" typically involves great dedication with special attention, because it is called the 'money gate'. The reason for this labelling is that, at gate "3", a decision is taken whether the firm is willing to allocate the necessary resources (financial, human and time) to that project or not. This also implies that gate "3" separates the fuzzy front end from the development phase of the innovation process.

3.2.1.2 Three-Phase Front End Model

The three-phase front end model divides the front end into three successive phases. These phases are: the pre-phase zero, phase zero and phase one. The foundation elements represent influencing factors of the pre-phase zero (Gassmann & Schweitzer, 2014, p. 19). The three phase model is illustrated in Fig. 12 below.

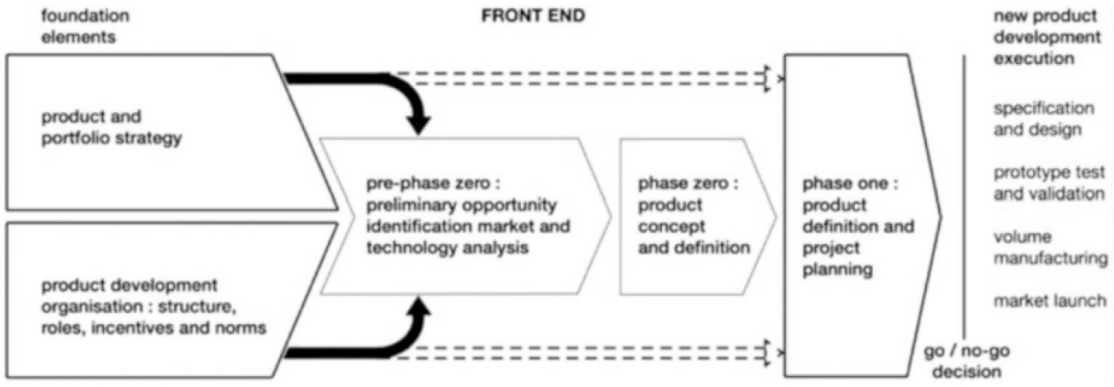

Fig. 12 Three phase front end model (Gassmann & Schweitzer, 2014, p. 19).

The following list contains the core elements of the three phase front end model (Gassmann & Schweitzer, 2014, p. 19):

Foundation elements: The foundation elements, also called influencing factors of the pre-phase zero, include the company's strategy, the product portfolio and the organisational structure of

the company, as well as external influencing factors like regulations and policies.

Pre-phase zero: Pre-phase zero describes the identification of opportunities, the generation of new ideas and the analysis of available technologies.

Phase zero: Phase zero includes all actions that correspond to the identification of customer needs, the competition situation and business perspectives on the one hand, and the development of a product concept on the other.

Phase one: Phase one finally realizes an evaluation of the technological and economic feasibility of the product concept. Phase one ends with a go or a no-go decision.

3.2.1.3 New Concept Development Model

Another way to describe the front end as a holistic process is the new concept development (NCD) model, which divides the front end into three areas. The three areas are described below and are illustrated in Fig. 13 (Belliveau, Griffin, & Somermeyer, 2002, p. 8):

Engine: The centre of the model, which represents the leadership style, the business strategy, the company's vision, and the innovation culture of the company, is labelled with the engine, because it drives the five activity elements.

Five activity elements: These define the area of the five controllable activity elements. They are opportunity identification, opportunity analysis, idea generation and enrichment, idea selection, and concept definition.

Influencing factors: The outer circle represents the external environment (outside world) like regulations, policies, customers and competitors that influence and affect the engine with its five activity elements. On the inside, the influencing factors consist of the elements organizational capabilities and the enabling sciences.

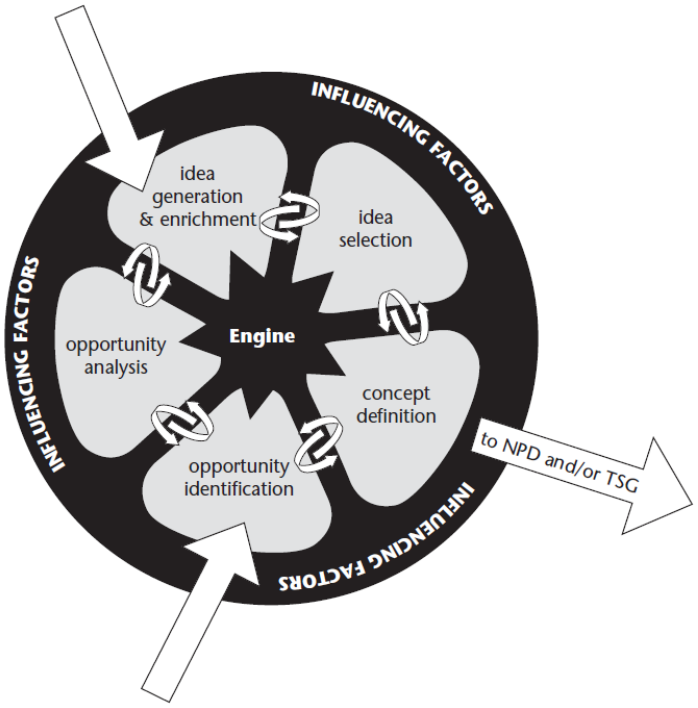

Fig. 13 New concept development model (NCD Model) (Kahn, Kay, Slotegraaf, & Uban, 2013, p. 118).

A unique characteristic of the NCD model is the circular arrangement of the five activity elements, which are not arranged in a special order. This enables them to be executed in a random sequence or even in a parallel way. It is also possible to use the activity elements more than once. This brings much more flexibility to the front end compared with the stage-gate process model and the three phase process model (Belliveau, Griffin, & Somermeyer, 2002, p. 9).

3.2.2 Summary and Recommendation for Action

After presenting the characteristics of three process models in the previous chapters, Fig. 14 illustrates in a table the comparison of pros and cons of these process models. After the comparison, the goal of this chapter is to make a recommendation for which process model is suited best for the structuring of the innovation process of a mobile app development.

Model	Pros	Cons
Stage-gate process (Cooper)	Very famous and frequently cited model	Product concepts can be stopped to early
	Flexible to both radical and incremental innovations	Gatekeepers low level of knowledge can lead to wrong decisions
	Integrates both the market and technological perspective	Lack of flexibility due to sequential approach, except third generation model
	Activities are performed in parallel fashion	
Three phase front end model (Khurana and Rosenthal)	Additional consideration of elements of the organizational environment (foundation elements)	No feedback loops
	Useful tool to visualize and structure front-end activities, reduce the fuzziness and ease communication	No description of the preliminary opportunity identification and idea generation in detail
		Tool lacks flexibility
		Decision making could be enhanced by a more structured process (especially in the pre-phase zero and phase one phases)
New concept development model (Koen et al.)	Includes all company related factors	Abstract model that is hardly transferable to a business situation
	Stimulates innovation due to its non-sequential order of phases	Practitioners criticize the lack of application of these methodologies
	Flexible with regards to both radical and incremental innovations	Model mainly focuses on product development
		Influencing factors are not controllable

Fig. 14 Comparison of the pros and cons of the three described process models (Gassmann & Schweitzer, 2014, p. 21).

As the NCD model approach includes all company relevant factors, and because of its non-defined starting point due to the circular arrangement, it shows a much higher flexibility compared to the other two process models. Thus, the NCD model was selected for practical application in chapter 6.

3.3 Managing the Fuzzy Front End

As previously described, the management of the innovation process is separated into three phases (Dornberger & Suvelza, 2012, p. 95):

Phase 1: The early innovation phase, also called fuzzy front end, consists of analysing and screening market opportunities. The most promising market opportunities are chosen in order to transform them into a concept for the new product.

Phase 2: The main focus of phase 2 is the implementation or development of the innovation project.

Phase 3: Phase 3 at the end of the innovation process deals with the product launch and the successful introduction of the new product to the market.

The target of this chapter is to present the goals as well as the key elements of proper fuzzy front end management.

The art of managing the fuzzy front end differs in many aspects form the classic management discipline of structured processes. Managing the fuzzy front end is much more like a balancing act between creativity and structured working. Fuzzy front end management is not about telling people what to do. Fuzzy front end management is the art of understanding customers, to identify their wishes and to provide a proper framework in order to create opportunities and new products (Gassmann & Schweitzer, 2014, p. 8).

The key drivers for a successful fuzzy front end management were illustrated in Fig. 15 below, and will be described in more detail in the section after. To get straight to the point, especially at the fuzzy front end of innovation, a proper management at the end is all about people (Gassmann & Schweitzer, 2014, p. 9).

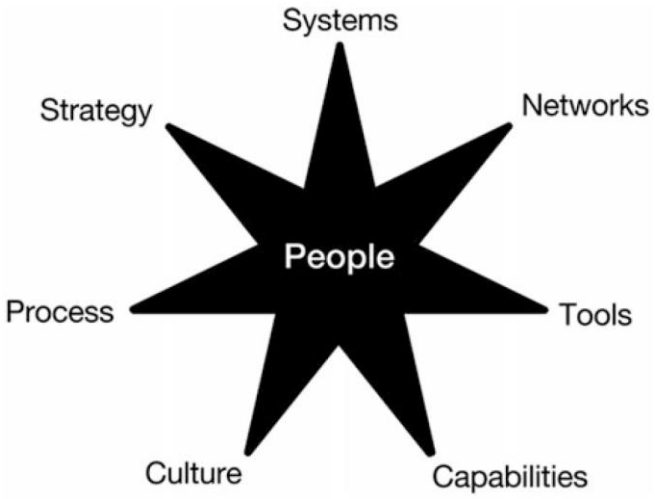

Fig. 15 Key factors which need to be considered in successful fuzzy front end management (Gassmann & Schweitzer, 2014, p. 9)

Strategy: It is of utmost importance to link the innovation activities to the strategy of the company. For example, in phase 1 of the innovation process, it is essential to choose only those opportunities that meet the general business strategy (Dornberger & Suvelza, 2012, p. 95). A company's

strategy gives the overall direction and thus enables a goal-oriented search of new opportunities in selected search fields. Linking the innovation activities to the company's business fields leads to a more efficient opportunity selection. It prevents the company from exploring the wrong opportunities, which can cause a loss of time and money, and ensures resources are available for the right opportunities (Gassmann & Schweitzer, 2014, p. 10). Otherwise, the company could innovate products that do not add any value to the existing customers. Only after defining the innovation fields in due consideration of the company's strategy, the screening of the right opportunities can take place (Dornberger & Suvelza, 2012, p. 95).

Systems: The context in which this goal-oriented search for the right opportunities is embedded is called innovation system. The innovation system is of utmost importance for ensuring a proper innovation management. It comprises all the infrastructure that supports the innovation management and helps the involved people to gain access to all relevant document and information, but also experienced stuff members. Therefore, information technology plays an essential role in the storage and accessibility of information, provides various communication channels, forms the basis for report generation and supports each stage of the innovation process. Apart from that, the implementation of measures for innovation success is a vital part of the innovation system (Dornberger & Suvelza, 2012, p. 52)**.** Those measures are closely linked to reward systems and incentive programmes that can help to enable the creativity potential of the employees and to keep them motivated (Dornberger & Suvelza, 2012, p. 50).

Networks: For the networks, in order to ensure proper innovation management, a distinction can be made between company-external networks on the one hand, and company-internal networks on the other.

The company's external network is characterised by the industry the company operates in as well as the company's strengths and weaknesses. An example for good partnership between companies may be the case in which one company is experienced with launching new products on the market, while the second company is experienced

in creating new products. Another type of partnership that requires a well-positioned network can be seen between two companies where each of them has detailed know-how in a specific market niche or technology, and they work in a close collaboration in order to develop a product based on both technologies. Another type of a R&D partnership is the cooperation with universities and other scientific institutes (Dornberger & Suvelza, 2012, p. 51).

The internal networks, on the other hand, provide the necessary connections in order to ensure proper communication channels, which are essential for the generation of ideas and the successful realisation of innovation projects. Otherwise, even those companies with the highest creative potential will fail and won't reach the expected outcomes (Dornberger & Suvelza, 2012, p. 49).

Tools: For efficient fuzzy front end management, the company needs to ensure that various tools of support throughout the entire innovation process are available to the employees. Tools that help the idea generation activities, for example, are brainstorming or idea banks. Furthermore, the company needs to ensure that those employees who are selected to work with these tools have the right skills, otherwise the company needs to organize trainings and courses (Dornberger & Suvelza, 2012, p. 100).

Capabilities: Resources (financial, human and time) need to be available at the right point in time in order to achieve a success of the innovation project. Therefore, after taking the "project approval" decision, it must be ensured that all required resources are available. Otherwise, it does not make sense to set the project to the status "approved for realization", because the project gets stuck in queue with other projects and the desired time-to-market is usually not feasible anymore. One of the most challenging tasks of this strategic axis is the financing of the innovation project (Dornberger & Suvelza, 2012, p. 52).

Culture: Innovation culture is described as the intangible assets and elements that have the greatest influence on the innovation behaviour of a company and its results. Furthermore, it describes the behaviour of how employees and stuff accept their roles, communicate between each other and face new tasks (Dornberger & Suvelza, 2012, p. 63).

As innovation itself and the way to manage innovation is a complex phenomenon, a proper innovation culture is needed in order to ensure the necessary creativity that is vital to innovate. Success factors within an innovation culture are (Dornberger & Suvelza, 2012, p. 48):

- Identify stuff members with the mission of the company
- Communicate business goals clearly in order to avoid communication mistakes
- Create an area of acceptance for new ideas
- Create an area of tolerance for mistakes so that employees are willing to take risks without being punished for making mistakes
- Eliminate innovation barriers like insufficient resource allocation, over-administration, …

Process: As already mentioned in chapter 2.4, “The Innovation Process”, each development of an innovation is characterised by a repeated number of actions. In case these actions are executed in an organised way, we talk about an innovation process. The task of innovation management is to select a suitable innovation process that will be used and optimized. The choice of the innovation process depends to a great extent on the type of innovation and the risks that are linked to the development of innovations. Innovations can be either radical innovations or incremental innovations. Radical innovations typically involve a higher risk and thus require more checkpoints than the innovation process. Incremental innovations, on the other hand, usually involve fewer risks, and therefore an innovation process with less gates is sufficient (Dornberger & Suvelza, 2012, p. 48).

3.4 Integrating Customers at the Fuzzy Front End of the Innovation Process

In order to speed up the innovation process and to enable new insights into the innovation process from external impacts, companies are opening their innovating processes. This phenomenon is called “open innovation and cross sourcing” and enables customer to bring in their own ideas. Thus, companies can gain access to the latent customers’ needs and customers themselves can act as co-producers of the needed products (Gassmann & Schweitzer, 2014, p. 31).

As already described previously in this thesis, the fuzzy front end of the innovation process is full of uncertainties. Those people who are responsible for the fuzzy front end, typically innovation managers, need to gain information to reduce these uncertainties in order to be able to take the right decisions. The information requested by innovation managers of the fuzzy front end can be either solution information or needs information (Gassmann & Schweitzer, 2014, p. 32). Both types of information are described below (Gassmann & Schweitzer, 2014, p. 32):

Solution information: Solution information helps to answer questions of technical feasibility, material and technology.

Needs information: Needs information, on the other hand, answers all question related to the market, such as, “Does the product meet a market?”, “Does it fulfil the customers’ needs?”.

In traditional companies, customers are usually seen as providers of needs information. Only few very open-minded companies try to win over customers as providers of solution information. (Gassmann & Schweitzer, 2014, p. 33).

3.4.1 Direct and Indirect Customer Integration

Literature distinguishes between two different types of customer integration, the direct and the indirect customer integration. Direct customer integration is also labelled *customer active paradigm (CAP),* and the indirect integration is also referred to as *manufacturer active paradigm (MAP)*. The list below describes the characteristic of the manufacturer active paradigm as well as that of the customer active paradigm (Gassmann & Schweitzer, 2014, p. 34):

Manufacturer active paradigm: The manufacturer active paradigm describes the traditional way of how to integrate the customer into the innovation process. The company requests information of needs from the customers and, based on that, starts with the development of a product in order to fulfil the customers’ needs. Thus, the company acts as an information collector and the customer acts as an information provider.

Customer active paradigm: The customer active paradigm, on the other hand, gives the customer a more active role because they act as a solution provider for the company. The task of the customer is to develop new product ideas, which are evaluated in a selection round, and the best ideas finally get realized by the company.

The figure below (Fig. 16) describes the differences between the manufacturer active paradigm and the customer active paradigm.

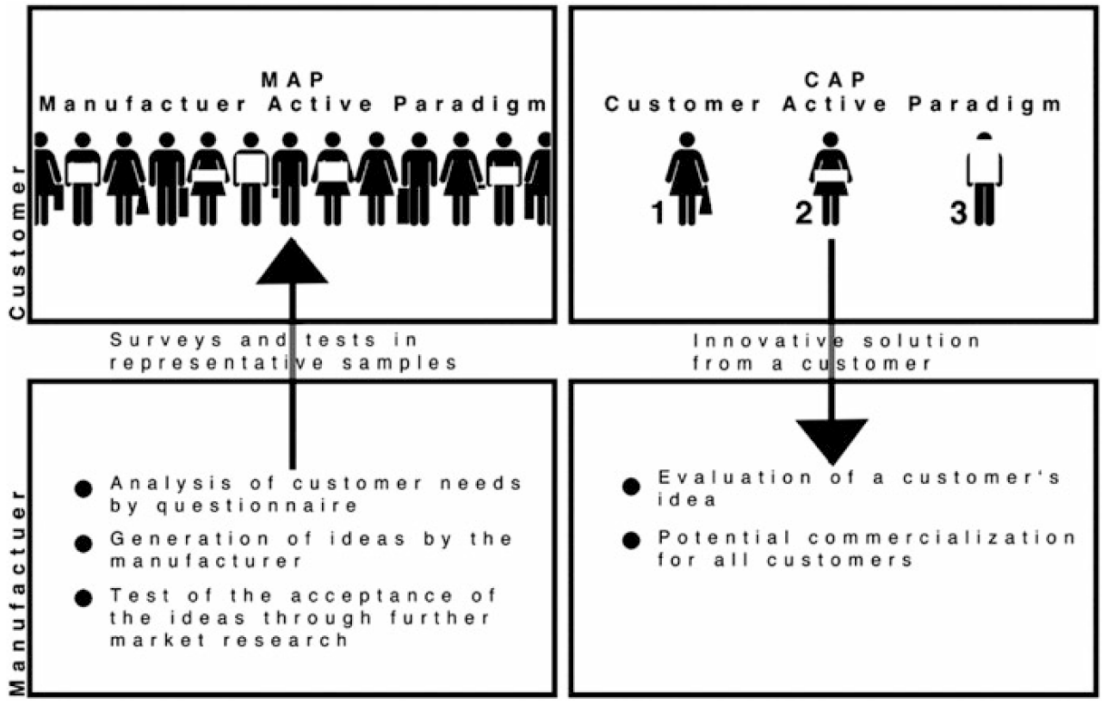

Fig. 16 Direct (customer active paradigm) and indirect (manufacturer active paradigm) customer integration (Gassmann & Schweitzer, 2014, p. 34).

The information flow in the manufacturer active paradigm is directed from the manufacturer to the customer. The manufacturer or company takes on the active part, and the customer provides only needs information when they are asked for it. In the customer active paradigm, on the other hand, the customer takes on the active role and provides information in form of solution information to the company (Gassmann & Schweitzer, 2014, p. 35).

3.4.2 Goals of Customer Integration

The goal of integrating customers into the innovation process is to use knowledge gained from customers to reduce market and technical uncertainties. This knowledge

can either be knowledge of existing products (current needs information) or of future product trends (future needs information). Current needs information can be accessed by asking customers about their satisfaction/dissatisfaction with current products or product ideas. A common method is prototyping, whereby the customers help to optimize the product in a specific area. In order to gain future needs information, customers can be invited to a “product of the future” workshop, where information about future needs can be collected. Those insights (current needs information and future needs information) is used by companies to increase their product acceptance on the market. This is done by adaptions of the products to meet the customer needs. In addition, this information is used for applying proper marketing strategies and to determine the market potential (Gassmann & Schweitzer, 2014, p. 36).

Apart from the main goal of reducing market and technical uncertainties, there are further reasons for companies to integrate customers, for example, early involvement of the customer in the product development phase in order to build a good relationship. This relationship makes customers feel more related to the product and thereby increases the probability of them buying the product (Gassmann & Schweitzer, 2014, p. 36).

3.5 Hypothesis

In chapter 1.3.2 the main research questions were presented. After providing detailed information in the previous chapters, the following section of the thesis is focused on revisiting research questions and applying them to the hypotheses. After evaluating these hypotheses in the following sections, they will be tested for their veracity in chapter 5.3.

Hypothesis 1: The outcome of an innovation project can be increased in case the fuzzy front end of innovation is structured with a strict innovation process like the stage gate process or the NCD process model.

Hypothesis 2: The impact of direct customer integration (customer active paradigm) on the innovation success is higher than that of indirect customer integration (manufacturer active paradigm).

4 CASE STUDY OF CUSTOMER INTEGRATION

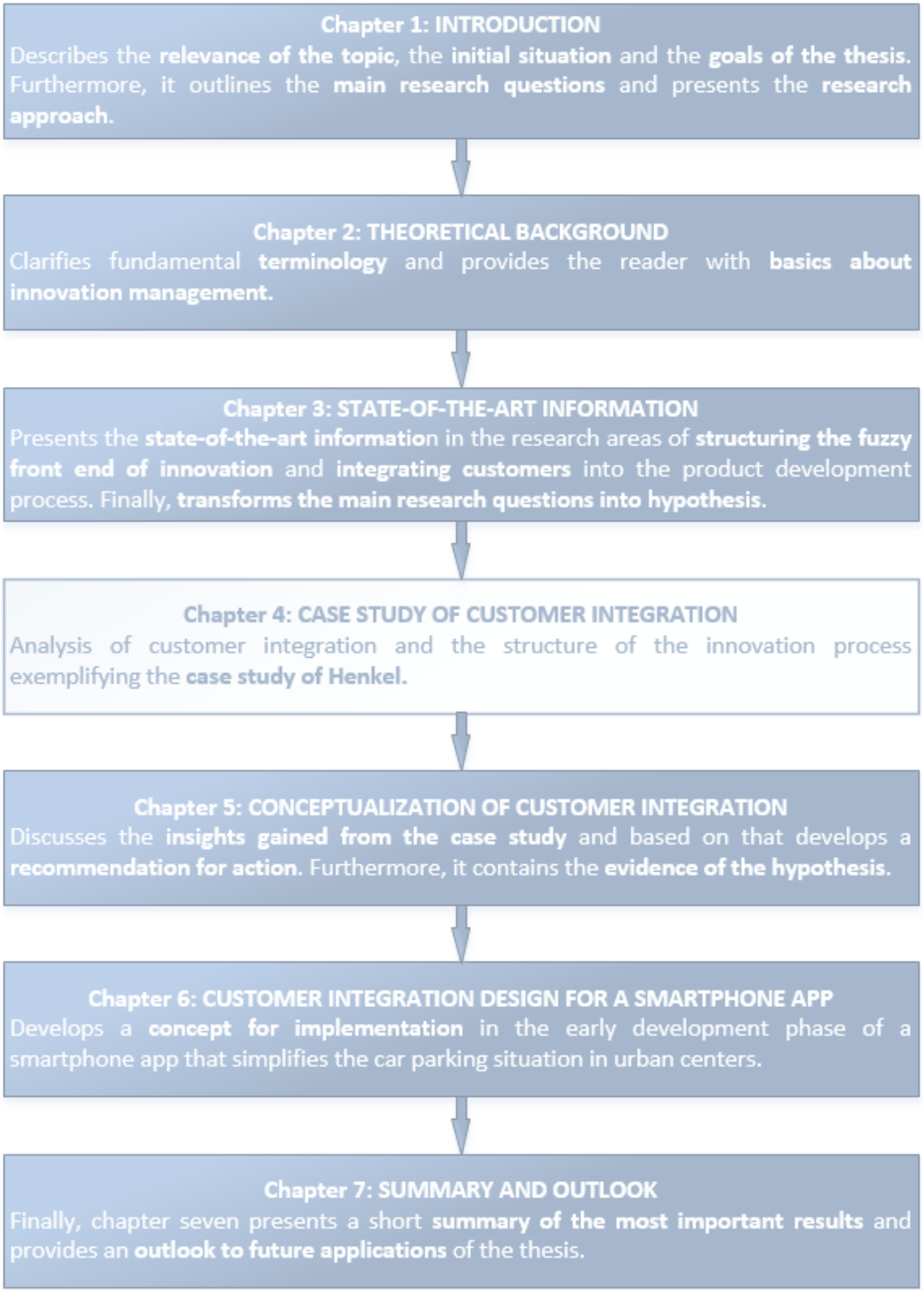

Fig. 17 Structure of the thesis

In order to evaluate the hypotheses proposed before, the following analysis shall offer new insights into the areas of structuring the fuzzy front end as well as the integration of customers in the early innovation phase. Those insights are later used as a basis

for the conceptualisation of the customer integration in the early innovation phase for the development of an innovative smart phone parking app.

4.1 Commonalities and Selection Criteria

The selection of the case study was based on the idea to gain as much information for the mentioned research areas as possible. Therefore, in the case study, a well-known, traditional company operating world-wide is represented. The company was selected due to its experience and its pioneer role in innovation management. A further selection criterion was the fact that the selected company operates in the consumer business. As a source of information, a scientific article dealing with the topic of innovation management at Henkel AG & Co. KGaA was chosen. In addition, data taken from the business reports will be discussed.

4.2 Case Study “Henkel”

The first corporate value of the company Henkel AG & Co. KGaA is, “We put our customers at the centre of what we do“. For more than 100 years, the success of Henkel has been based on knowing and fulfilling its customers’ needs. In 2007, the world-famous detergent Persil celebrated its 100th anniversary, one out of plenty of products that Henkel supports to achieve its vision: A global leader in brands and technologies (Casaro, Schollenberger, & Zengerling, 2016, p. 36).

Henkel AG & Co. KGaA is separated into three business units: Laundry & Home Care, Beauty Care and Adhesive Technologies. The total turnover in 2015 amounts to €18 089 million and the operating profit (EBIT) reaches €2 645 million, which equals 17.9 per cent of turnover. Henkel was founded in 1876, and at the end of 2015, Henkel was employing 49,450 people at various regional centres around the world and at its headquarters in Düsseldorf. (Casaro, Schollenberger, & Zengerling, 2016, p. 57).

4.2.1 Framework

Henkel has a central research and development laboratory at the headquarters, and additionally operates local research laboratories around the world in order to fulfil customers’ and market-specific requirements (Casaro, Schollenberger, & Zengerling, 2016, p. 85).

In order to meet the market and technology requirements, Henkel implemented an innovation management system that consists of a total of five elements which were

presented in Fig. 18. Each of these elements has a clear focus on customer orientation (Wuhrmann, Burkhart, & Kirschbaum, 2009, p. 26).

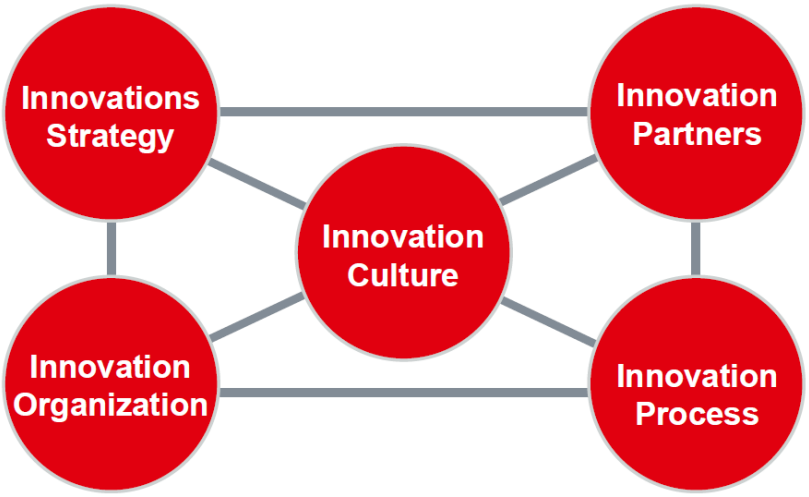

Fig. 18 Key elements of Henkel's innovation management system (Wuhrmann, Burkhart, & Kirschbaum, 2009, p. 26).

The list below describes the core elements of Henkel's innovation process in a greater detail:

Innovation Strategy: Henkel has recognized the importance of innovation itself and the importance of a correlation between innovation activities and their corporate strategy already years ago. For example, Henkel declared its 130th anniversary as the year of innovation. Each of the approximately 50 000 employees was encouraged to come up with at least three innovative product ideas during that year. Furthermore, in 2007, Henkel celebrated the 25th anniversary of the "Fritz Henkel Innovation Prize". Every year, the prize is awarded to the best product innovations within the Henkel Group that meet customers' needs better than before (Wuhrmann, Burkhart, & Kirschbaum, 2009, p. 26).

Innovation Organization: Nowadays, customers are more demanding, which means that the speed at which they impose new requirements increases steadily.

Thus, product life cycles are shortened and competition is more intense. In order to deal with this environment, Henkel changed its R&D structure in the beginning of 2008 from a centralised to a decentralized one. This offers the advantage that R&D activities are closer to the customers, and thus Henkel can react faster to changes on the market (Wuhrmann, Burkhart, & Kirschbaum, 2009, p. 26).

Innovation Processes: The innovation process itself is also one out of five core elements of Henkel's innovation management system. The innovation process is to be described in more detail in the following chapter of the thesis.

Innovation Partners: The strategy of open innovation was already implemented years ago, and also in the years to come, Henkel will focus on innovations that come from both internal and external sources. Thus Henkel has intensified its efforts to incorporate external partners like customers, universities, research institutes and suppliers in their innovation process (Casaro, Schollenberger, & Zengerling, 2016, p. 84).

4.2.2 Innovation Process

The Innovation process at Henkel is called "Inno Gate Process", which is presented in Fig. 19 below. It follows the guidelines of a stage-gate process where go or no-go decision are taken at each process gate (Gassmann & Schweitzer, 2014, p. 237).

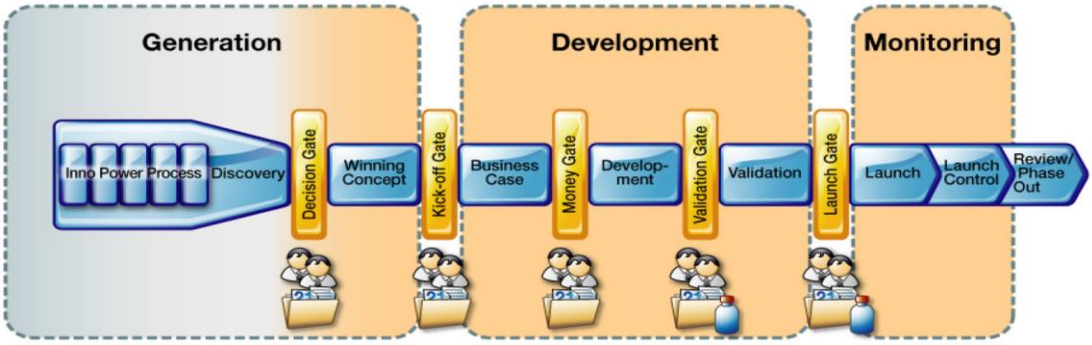

Fig. 19 Innovation Process at Henkel (Kirschbaum, Leading in Innovation, 2009, p. 17)

The Inno Gates have been systematically implemented into Henkel's innovation process since 2008, which is why each innovation project needs to pass each one of the various gates. Thus it can be ensured that the project brings specific advantages with regard to product performance, added value for customers and consumers, and social criteria (Bergmann, et al., 2015, S. 22). The process starts with the idea generation and detection phase, where customers are incorporated for the first time.

As mentioned above, Henkel has implemented their Inno Gate process in 2008 (Bergmann, et al., 2015, S. 22). The following section presents the effects on selected key performance indicators from 2008 to 2011.

Innovation rate:

The innovation rate describes the amount of turnover realised with products not older than three years over the total turnover. In the year of implementation of the Inno Gate process, Henkel's innovation rate was 30 per cent (Juesten, Luckenbach, Wilhelm, & Zengerling, 2009, S. 31). Three years later, mainly due to the introduction of the Inno Gate process, and thus the increased efficiency in identifying new opportunities, Henkel's innovation rate reached 41 per cent (Spitzer, Wilhelm, & Zengerling, 2012, S. 46).

Open innovation rate:

After introducing the concept of open innovation in 2008, the open innovation rate peaked at 81 per cent in 2011. The open innovation rate describes the number of innovations with a significant external contribution over the total

> number of innovations (Kirschbaum, Open Innovation bei Henkel: Wie (externe) Innovationen und Erfinder einbezogen werden, 2012, p. 11).

These two key performance indicators represent the significant impact of introducing the Inno Gate process in 2008.

4.2.3 Customer Integration

In the fourth element of Henkel's innovation managements system, which is 'innovation partners', the integration of customers plays an essential role. Henkel employs various methods to integrate their customers into the innovation process, like customer observation or customer diaries.

Customer observation is one of the basic methods within the Henkel Group in order to gain information about the market. Product developer and marketing specialists pay customers all over the world home visits to watch them by using Henkel's products but also competitive products. The gained insights influence the development of further products in a direct way (Wuhrmann, Burkhart, & Kirschbaum, 2009, p. 26).

As a second very useful tool to integrate customers into the innovation process, Henkel discovered customer diaries. They were given to customers who noted down their product experience, which trends they follow and how they use the products. Those insights were filtered and innovation specialists transformed them into product ideas, which now run through the entire innovation process (Wuhrmann, Burkhart, & Kirschbaum, 2009, p. 26).

One example for customer integration can be seen in the development of a new detergent for the Indian market. It is an age-old home remedy of Indian housewives to add a cap of blue dye to a load of white laundry, which will let dresses shine especially bright in the summer sun. Indian customers brought the idea of integrating the blue dye into a detergent to Henkel, and Henkel developed a special detergent for the Indian market. The result was clear: sales went up by 35 %, a result based on direct customer integration (Wuhrmann, Burkhart, & Kirschbaum, 2009, p. 28).

5 CONCEPTUALIZATION OF CUSTOMER INTEGRATION

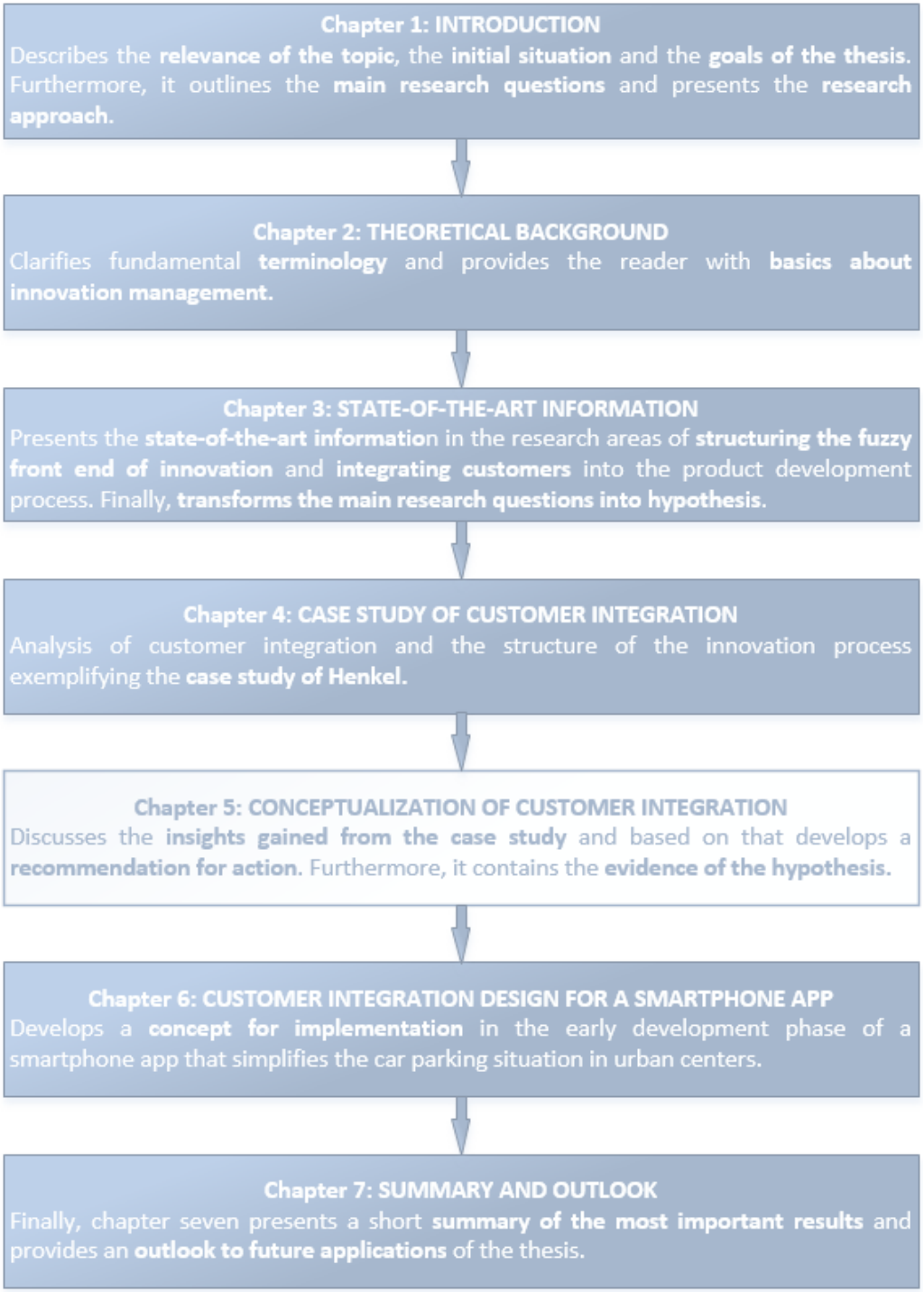

Fig. 20 Structure of the thesis

Based on the insights gained from the case study, the following chapter will identify the scope for action in order to design a proper customer integration for the smartphone app. This is done in chapter 6. First, the insights of the case study will be discussed.

5.1 Insights from the Case Study

Based on the case study, the following section is used to identify the main design fields for proper customer integration. The goal of customer integration is to identify new trends on the one hand, as well as the generation of ideas and opportunities within this trends on the other. Those customers who were selected to find new trends, opportunities and ideas need to have unique characteristics that support the participation in the innovation project. Furthermore, customers need to be interested in solving the problem description, either personally or in a professional way. Only in case the right customers are selected is the company able to gain advantages that wouldn't be possible without integrating customers. This advantage can be concretized in various forms, like reducing developing risk of the company, the generation of new ideas, or in form of a supervisory body. In order to realise these advantages, customers need to have a certain **competency profile.** Such competencies can be applied to various **customer roles**. Apart from a customer competency profile, the integrating company needs to provide a proper innovation culture that enables innovation and to identify **the right moment in time for customer integration**. Part of this innovation culture is a corporate strategy that focuses on innovation and links the corporate strategy with the **aims of the producer**. The innovation culture itself needs to allow for employees thinking in creative ways that go beyond departments and business units. Of course, the company also needs to allocate the resources required for customer integration, especially for the follow-up work. In order to use these resources as efficient as possible, a proper **structure of the fuzzy front end** is required.

To sum up, the case study provides five design fields that will be discussed in more detail in the following chapter. The identified design fields with the highest leverage on the success of an entire innovation project are:

- Structure of the fuzzy front end
- Aims of the producer
- Customer roles
- Competency profile
- Right moment of time for customer integration

5.2 Scope for Action

In the listing below, all main design fields were described in more detail.

Structure of the fuzzy front end: Already in 2008, Henkel discovered that systematic idea generation and opportunity development need systematic processes. Therefore, Henkel developed the Inno-Gate process, which is based on the stage-gate process model. Due to much higher uncertainty, with regard to product specification of the parking app, than Henkel is confronted with, the NCD model was chosen for structuring the innovation process for the development of the smartphone app. The detailed implementation is to be discussed in chapter 6.1

Aims of the producer: Generally speaking, the integrating company pursues the goal of increasing the innovation success by integrating customers in their innovation process. Thus, the integrating company gains advantages that can't be covered by internal resources and competencies. Thus, it is a major design field to identify the specific aims of the producer (integrating company) in order to adjust all ongoing innovation activities accordingly. The aims of the producer will be discussed in more detail in chapter 6.2.

Customer roles: Derived from the aims of the producer, the customer can take over various roles that help the integrating company to achieve their goals. Thus, the identification and the proper management of customer roles was identified as the third main design field for designing a customer integration system applied in the development process of the smartphone app. Customer roles will be discussed in chapter 6.3.

Competency profile: Various customer roles impose a specific competency profile that customers need to have

in order to fulfil their role. As the case study of Henkel already pointed out, it is of utmost importance to select the right customers for each task. Thus, the customers' competency profile was identified as the fourth main design filed. Its application to the smartphone app development will be presented in chapter 6.4.

Point in time for customer integration:

The right moment for customer integration was identified as the last main design field. This item shall be discussed in chapter 6.5 from a closer perspective.

5.3 Hypotheses revisited

After transforming the main research questions into hypotheses, the following section will concentrate on testing them for their validity. The evidence is based on the insights gained from the case studies. First, the two hypotheses will be presented again:

Hypothesis 1: *The outcome of an innovation project can be increased in case the fuzzy front end of innovation is structured with a strict innovation process like the stage gate process or the NCD process model.*

Hypothesis 2: *The impact of direct customer integration (customer active paradigm) on the innovation success is higher than by usage of indirect customer integration (manufacturer active paradigm).*

The veracity of hypothesis 1 can be confirmed by looking at the Henkel case study, where the impacts of introducing the Inno Gate process in the year 2008 showed that the key performance indicators "innovation rate" as well as "open innovation rate" increased significantly in the subsequent three years until 2011.

The veracity of hypothesis 2 can also be confirmed by looking at the Henkel case study, where an increase of sales by 35 per cent was reached due to a specific detergent for the Indian market. In this example, the product idea as well as the concept for the detergent with the blue dye was developed by future customers.

6 CUSTOMER INTEGRATION DESIGN FOR A SMARTPHONE APP

Fig. 21 Structure of the thesis

The following section of this thesis will be dedicated to practically apply the confirmed hypothesis to the design of the customer integration, by example of the development of an innovative car parking smartphone app. The hypotheses are based on the

theoretical background (given in chapter 2), as well as on the state-of-the-art information in the areas of structuring and managing the fuzzy front end on the one hand, and customer integration one the other (see chapter 3). Based on the case study, it has been possible to confirm the veracity of the hypothesis and to provide a recommendation for action. The following chapter transforms this recommendation of action into a detailed design guideline. For the transformation, the fuzzy front end first gets structured by means of the NCD model, and afterwards detailed aspects of customer integration will be investigated and developed.

6.1 Structuring the Fuzzy Front End

Section 3.2.1 of this thesis presented the ways of managing the fuzzy front end by means of process models. The following chapters will now describe the application of the NCD model in more detail.

As mentioned previously, the innovation process is divided into the following three areas (Belliveau, Griffin, & Somermeyer, 2002, p. 5):

- Fuzzy front end (FFE)
- New product development (NPD) phase
- Commercialisation phase

The goal of this chapter is to provide detailed knowledge of how to manage the fuzzy front end. Therefore, for each part of the NCD model, the most efficient methods and tools will be presented. These methods and tools will help the integrating company to structure the FFE and to integrate customers. The NCD model describes the whole innovation process by separating them into three main areas (Belliveau, Griffin, & Somermeyer, 2002, p. 8).

- The influencing factors, which are organizational capabilities, outside world and enabling sciences.
- The engine.
- The five controllable activity elements, which are opportunity identification, opportunity analysis, idea generation and enrichment, idea selection and concept definition

The tools and methods for each part of the NCD model will be described below.

6.1.1 The Influencing Factors

The influencing factors describe all forms of possible impact on the five controllable activity elements and the engine. These factors are organizational capabilities, the outside world and the enabling science, which will be described in more detail in the following list (Belliveau, Griffin, & Somermeyer, 2002, p. 10):

Organizational capabilities: Organizational capabilities describe the way a company identifies and analyses new opportunities, generates and selects new ideas and how the company develops concepts and business plans. The better results a company achieves by implementing this capabilities, the better the company is able to deal with the influencing factors of the outside world.

Enabling science: The second influencing factor describes the availability of enabling science and technology. As new technologies typically build upon existing technologies, their availability is of vitally importance.

Outside world: Outside world describes all impacts caused by law, government policies and regulations, customers, competitors, the political and economic climate and the distribution channels of a company. All these elements can influence the fuzzy front end of the innovation process. Porter's five forces model can be used to describe the element and enables a transparent presentation. A detailed presentation of the five forces model can be found in the following.

The five forces model of porter describes the power of rivalry between competitors within the same industry (Kleinaltenkamp & Saab, 2009, p. 47). These five forces are bargaining power of suppliers, bargaining power of customers, threat of new entrants and threat of substitute products or services, which describes rivalry among existing competitors (Porter, 1997, S. 6). In many cases, the analyses of a company's competitive situations by means of the five forces model of porter inspires new

innovations (Belliveau, Griffin, & Somermeyer, 2002, p. 10). Fig. 22 below illustrates the model.

Fig. 22 Porter's five forces model (Dälken, 2014, S. 3)

This influencing factors only partially control a company. That is, factors such as changes in the competitive situation, as would be a new firm producing similar goods entering the market, cannot be controlled by the company. Nevertheless, the impact the company suffers, its five activity elements, and the engine exist (Belliveau, Griffin, & Somermeyer, 2002, p. 10). Thus, it is a key competence for a company to react on changes by executing its strategy efficiently and quickly in case changes occur. A quick and efficient strategy execution require lean communication throughout the entire organization. Good and efficient communication enables the company to foresee changes that might occur and, in turn, provides the company with time to decide on the next steps and additional time to act. These two resources (time to act and time to decide) are the most important ones to have for dealing with changes in the influencing factors in a proper way (Belliveau, Griffin, & Somermeyer, 2002, p. 12).

6.1.2 The Engine

The engine is described as the sum of three elements: leadership, culture and business strategy. Showing a good performance in these areas distinguishes highly innovative companies from those with less innovative spirit (Belliveau, Griffin, & Somermeyer, 2002, p. 12).

It is of utmost importance that senior management is involved from the very beginning of the innovation process of a new opportunity, in order to figure out if the opportunity does make strategic sense. Thus, it can be ensured that the opportunity really fits the company's strategy (Belliveau, Griffin, & Somermeyer, 2002, p. 12). To empower employees to real creativity, the innovation culture is of importance. In a study of Zein and Buckler, the key success factors of proper innovation culture were described as follows (Belliveau, Griffin, & Somermeyer, 2002, p. 13):

Demonstrate importance: Leaders need to demonstrate the importance of an innovation for the company by means of all of their actions and decisions.

Encourage employees: Leaders need to encourage their employees to try something new. Managers, for example, could ensure that employees work a specific percentage of their total working time on their own projects in order to produce innovation.

Create Relationships: Leaders need to break down the barriers of communication between their employees in order to also create inter-divisional relationships. A possibility for that is to force all employees to change their department for a determined period of time.

Generate customer intimacy: Leaders need to encourage employees to interact in the closest way with customers in order to build up a proper customer intimacy. At the end of the day, the same customers will provide detailed insights into their thinking and thus provide new opportunities and ideas for the company.

Engage whole organization: Leaders need to increase the sense of urgency for innovation and promote in the whole organization the understanding that innovation is the fundamental way for the company to bring value to its customers.

Create motivating environment: Leaders need to establish an overall environment that encourages and motivates employees to innovate.

Tell powerful stories: Leaders need to tell stories about successful innovations that promote the principles and practices of innovation.

In order to achieve a culture that enables creativity and supports innovation, two instruments can be applied. The first instrument was developed and published by the Creative Problem Solving Group and is called the Situational Outlook Questionnaire; this questionnaire measures innovation culture on nine scales. These scales are: challenge and involvement, freedom, idea time, idea support, playfulness and humor, interpersonal conflicts, debates in issues, trust and openness, and risk taking (Belliveau, Griffin, & Somermeyer, 2002, p. 14). In order to increase the innovation culture of a company, regular assessments need to be carried out and, based on the results, appropriate countermeasures for each item need to be defined.

The second instrument is called KEYS and was developed by the Center for Creative Leadership. It measures the innovation culture by six “encourage creativity” items and two “hinder creativity” items. The six pro-creativity items are: organizational encouragement, supervisory encouragement, work group supports, resource availability, challenging work, and freedom. The two counter-creativity items are: organizational impediments and workload pressure (Belliveau, Griffin, & Somermeyer, 2002, p. 14).

6.1.3 The Five Controllable Activity Elements

As already mentioned in chapter 3.2.1, the five controllable activity elements are defined as: opportunity identification, opportunity analysis, idea generation and enrichment, idea selection, and concept definition. The following chapters will serve to describe the most efficient tools and methods for each of the five elements.

6.1.3.1 Opportunity Identification

The element opportunity identification is about finding new trends where future opportunities may be discovered, and the company may pursue these opportunities in the future. All actions related to the opportunity identification are typically linked to business goals in order to ensure that the new opportunities match the company’s strategy (Belliveau, Griffin, & Somermeyer, 2002, p. 15).

Two methods for forecasting the uncertain future, which are particularly suitable for the software development branch and mobile app development, are technology road mapping and scenario planning (Belliveau, Griffin, & Somermeyer, 2002, p. 16).

Technology roadmaps are used to illustrate the process of technology planning. Furthermore, technology roadmaps represent the interfaces between different planning layers (Möhrle & Isenmann, 2008, p. 3). Technology roadmaps provide information about current and planned actions, illustrate decisions taken in the past, and show dependencies and causalities of all activities linked to technology planning. The application of technology roadmaps enables the company to both identify the current position and to plan and visualize the way towards its desired technology goals (Klappert & Schuh, 2011, p. 207). Fig. 23 shows a generic form of the presentation of a technology roadmap. This example represents the link between planned technologies and products.

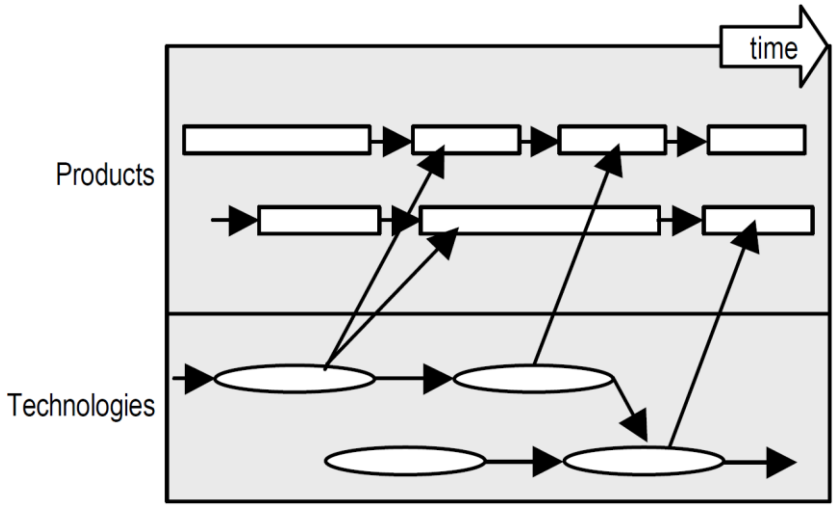

Fig. 23 Main elements of a technology roadmap (Klappert & Schuh, 2011, p. 208).

The main elements are: time line, different levels (product and technology as shown in the figure above; further levels that can be shown in a technology roadmap are, for example, market, business, skills or competition), as well as connections between the planning objects. The goal of the technology roadmap is to indicate the links between technologies and products, in order to enable the company to identify future trends for opportunity identification.

The second instrument for opportunity identification is scenario planning. Scenario planning is used to prepare for future scenarios by bringing the user or the company in a situation where they think about possible scenarios that otherwise would be ignored. It is the task of the company to identify possible future scenarios. Thinking

about these scenarios will provide the company with more detailed insights on what opportunities might arise in the future (Belliveau, Griffin, & Somermeyer, 2002, p. 16).

6.1.3.2 Opportunity Analysis

The second of the five controllable activity elements is called opportunity analysis, which has the goal to evaluate whether an opportunity is worth pursuing or not. In order to do so, additional information is required to reduce the uncertainty of the opportunity (Belliveau, Griffin, & Somermeyer, 2002, p. 17).

The tools that were used in the opportunity analysis are almost the same as those introduced for the element opportunity identification. Apart from technology road mapping and scenario planning, further instruments for this element are: technology trend analysis, competitive intelligence analysis, and customer trend analysis. While for the element of opportunity identification these tools were applied in order to find out whether an opportunity is available, the element opportunity analysis investigates the selected opportunities in more detail (Belliveau, Griffin, & Somermeyer, 2002, p. 18).

6.1.3.3 Idea Generation and Enrichment

The third element, idea generation and enrichment, describes all actions linked to the origin and the development of a concrete idea (Belliveau, Griffin, & Somermeyer, 2002, p. 19). Fig. 24 below illustrates the sources of new ideas on the on hand, as well as the most efficient tools to be applied on the other.

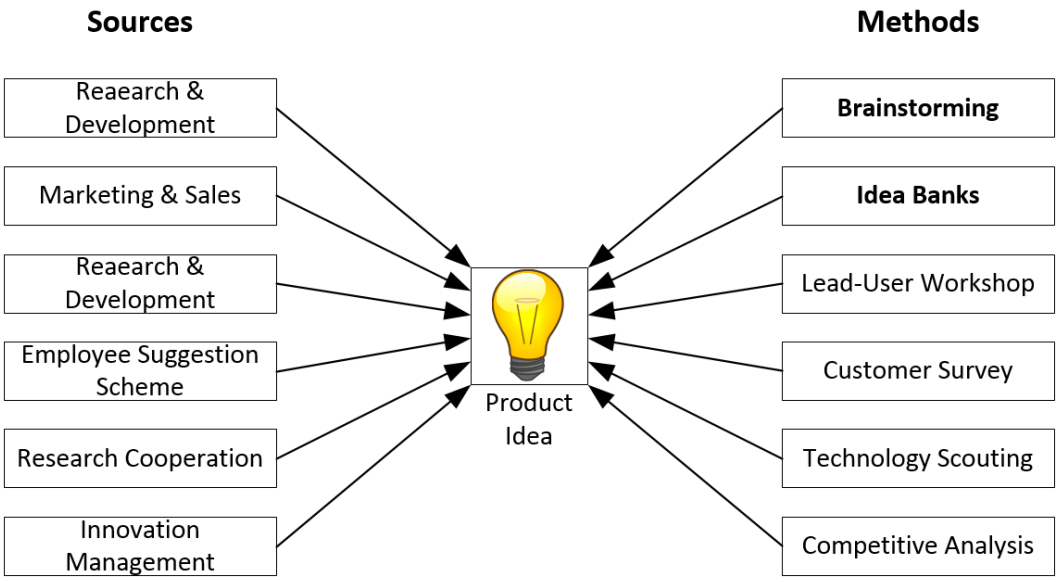

Fig. 24 Source and methods for opportunity identification (Rode, 2013, p. 11).

Commonly used tools that find application in the element idea generation and enrichment are brainstorming and idea banks. Idea banks usually take the form of a homepage where employees of a company can post and discuss new ideas about almost each and every topic. After selection of the best ideas, the company decides which ideas to pursue (Belliveau, Griffin, & Somermeyer, 2002, p. 19).

As in many cases during those brainstorming sessions, on the one hand, and by filtering the idea banks on the other, new opportunities arise, and the element idea generation and enrichment often feeds the element opportunity identification (Belliveau, Griffin, & Somermeyer, 2002, p. 19).

6.1.3.4 Idea Selection

Usually, the origin of new ideas is not a problem. Most idea banks installed in companies are heavily used by employees. The more challenging task for a company is the selection of ideas to pursue. This decision is of utmost importance for future success of a company and usually an iterative process, see Fig. 25 below (Belliveau, Griffin, & Somermeyer, 2002, p. 22).

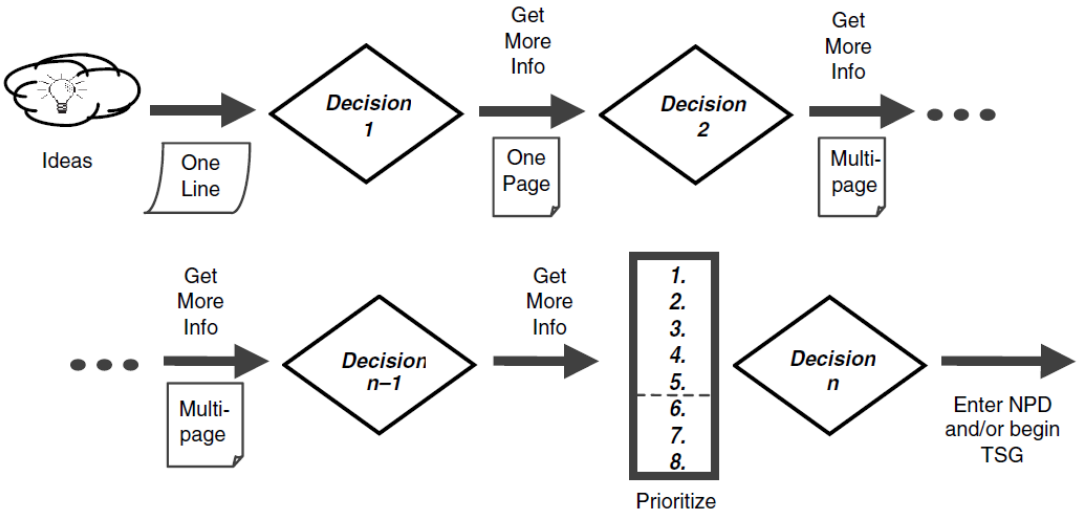

Fig. 25 Iterative idea selection process (Belliveau, Griffin, & Somermeyer, 2002, p. 23).

After the first rise of a new idea, only a very limited amount of information is required in order to take the first decision on whether or not to pursue it. In case the idea seems attractive for further development, more and more information is needed. The company needs to ensure that proper resources are available for developing the idea. The number of iterations depends on the idea and the type of environment the idea is set in. Finally, after all “go” or “no-go” decisions have been taken in a positive way,

the idea comes into the NPD (new product development) phase (Belliveau, Griffin, & Somermeyer, 2002, p. 23).

6.1.3.5 Concept Definition

The final element of the NCD process model is concept definition. All innovations that reach the NPD (new product development) phase need to pass this element, because it is the only way to exit the NCD model. Many firms install a gate at the interface between the NCD and the NPD phase, with specific hurdles an innovation needs to pass. Otherwise, the innovation is rejected and the concept returns to the NCD phase, where it can be adapted in order to pass the hurdles in a second trial (Belliveau, Griffin, & Somermeyer, 2002, p. 26).

Hurdles are questions regarding customer, market, business strategy, competition, product, technology, manufacturing processes and the like (Belliveau, Griffin, & Somermeyer, 2002, p. 27). Typical questions are:

- Does the concept match the corporate strategy?
- What is the market's size and what market share can be addressed by the company?
- Have all risks been evaluated?
- Are there any other threats (like safety policies, governmental regulations, etc.) that could stop the project?
- Does the company have all the resources required for developing the project available?
- Etc.

Before evaluating these aspects, a set of limit values that must be exceeded by each question is defined. In case the innovation is able to pass all these hurdles, the company increases the resources in order to develop the final concept. The final concept or outcome of the element concept definition is a business plan. In case the hurdles cannot be passed, the project is either rejected or needs to be adapted in earlier NCD phases (Belliveau, Griffin, & Somermeyer, 2002, p. 27).

The table below shows typical examples of evaluation criteria used for evaluating projects before they pass to the NPD phase:

Factors	Specific Issues	Attractive	Unattractive
Market	Market size	>$100 million	<$10 million
	Market growth	>20%	<5%
	Market drivers	Satisfy all	Meets at least one
	Market access	Existing business	Needed
	Potential market share	>20%	<5%
Competency	Business infrastructure	In place	Needed
	Customer familiarity	Current base	Few
	Core competency	Recognized	None
Competitive Issues	Proprietary position	Yes	No
	Leadership position	#1 by year 5	No lead
	Cost position	Lowest	Highest
	Key competitive advantage	Proprietary	None
	Sustainability of position	High	Low
Time Factors	Time to sales	<2 years	>5 years
	Full commercialization	<5 years	>5 years
	Competitive time advantage	>2 years	<1 year
	Operating at break-even	<3 years	>5 years
Technology	Technology availability	In place	Needed
	Technology readiness	Proven	Discovery still needed
	Technology skill base (people and time)	Available	Needed
Financial	After-tax operating income	>12%	<8%
	Maximum cash hole	<$20 million	>$50 million
	Revenue stream	>1 product line	1 product
	Business potential	>$100 million	<$20 million

Table 2 Typical examples of evaluation criteria applied before passing the project to NPD phase (Belliveau, Griffin, & Somermeyer, 2002, p. 28)

6.1.4 Summary

The original version of the NCD model arranges five activity elements in a circle. In order to ensure clearness and easy understanding, Fig. 26 illustrates the five activity elements of the NCD model in a sequential order. This representation of the NCD model is used in the course of this thesis in order to illustrate customer integration and the integration strategy.

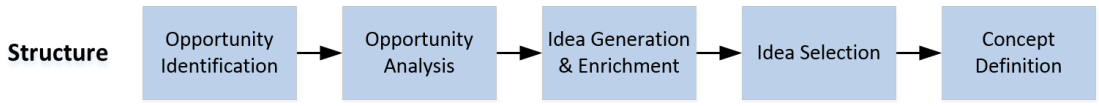

Fig. 26 Sequential presentation of the five activity elements of the NCD model (own illustration).

6.2 Aims of the producer

First, the aims of the producer (developer) of the app will be described. The general aim of a producer integrating customers in the early innovation process is to increase the innovation success of the company that wants to integrate the customers. That is, the company expects advantages by integrating customers, which can't be covered by own resources and competencies. The idea behind this approach is to increase the innovation success by developing new ideas and concepts together with customers and their knowhow. However, customer integration does not always lead to more innovation success. Certain disadvantages and risks, like the high dependence on customers, the loss of knowhow away by the company or longer and costlier innovation processes caused by additional coordination effort, are only few of the disadvantages.

The table below summarizes the aims of customer integration for the development of the innovative car parking smartphone app by breaking it up into four focus areas (Wecht, 2006, p. 141):

Focus	Aims of the producer
Product Focus	➢ Generation of new product ideas ➢ Detailed information about customer needs ➢ Feedback on product concepts and prototypes ➢ Increasing quality and performance of the product ➢ Support during product development
Market Focus	➢ Gaining detailed market insights and information about competitors ➢ Improving the competitive position by establishing reference customers ➢ Increasing customer loyalty by means of a more intense relationship
Risk Focus	➢ Reducing risks of undesirable development ➢ Increasing outcome of innovation projects or number of projects passed on to NPD phase ➢ Gaining insights into the product usage behaviour of customers
Resource Focus	➢ Reducing R&D costs ➢ Reducing lead time of innovation projects ➢ Increasing the number of parallel innovation projects ➢ Support in innovation marketing

Table 3 Aims of producers of customer integration in the innovation process (Wecht, 2006, p. 141).

As the smartphone parking app is a new and innovative concept, there are hardly any experiences with similar applications, neither is there information about customers' needs. Thus, the aim of practical application is to integrate customers in a very intense way, and thus have the customers play an essential role throughout the entire innovation process. The role of customers will be described in the next chapter. Before doing so, Fig. 27 below illustrates the specific goals of the producer linked to the stages of the NCD model.

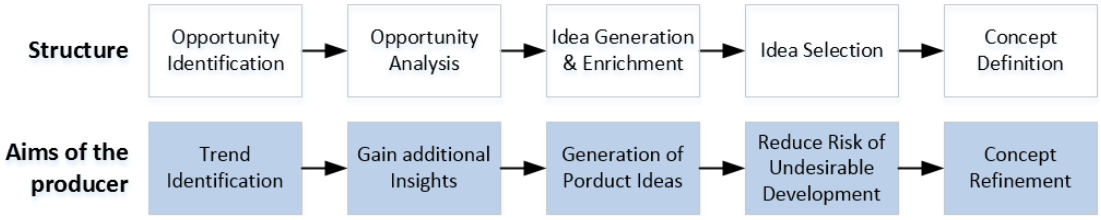

Fig. 27 Aims of the producer in the different stages of the NCD model (own illustration)

6.3 The Role of Customers

Proper customer integration implies that, throughout the innovation process, customers need to act in various roles, like 'customer as a resource', 'customer as a developer' or 'customer as a user'.

The role 'customer as a resource' describes the case where customers play an active role as the source of new ideas. The role 'customer as developer', on the other hand, enables the customer to be actively integrated into the design and the development of the product. Finally, the role 'customer as a user' integrates customers into the actions of product tests and prototype evaluation on the one hand, but also as an in-field-tester of the already launched product on the other. The following chapters describe the various roles of customers in more detail.

6.3.1 The Role "Customer as a Resource"

The focus of this thesis is on customers acting as a source of new product ideas. Apart from that, customers can act as various other resources (e.g. as a financial resource) which were not further described in the course of this theses.

Various authors of the consulted literature argue that customers should play an essential role in the generation of new product ideas. Others say that integrating customers into the early innovation phase only leads to incremental product innovation (Wecht, 2006, p. 143). Let us consider the following example: What answer would people have given Henry Ford at the beginning of the 19th century to the

following question, “What do you want?” They would most probably have answered, “Give us faster horses”, but nobody would have answered that he invents a radical new way of transport like the automobile at that time. This example illustrates that customer integration is not only about asking customers what they want. It’s about integrating them in a more intense way.

The recommendation of action for the development of the smartphone app is to integrate customers into the early innovation phase as lead user. Lead users are defined as (Franke & Shah, 2003, p. 164):

“Lead users are a relatively small fraction of users who are highly likely to innovate, are ahead of product or service trends, and would benefit greatly from the advent of new products or services.”

The difference between lead users and standard users can be described by means of two attributes. Lead users feel the necessity of a new product or service already months or even years before the market follows with the same understanding and feeling. The second aspect of distinction is that lead user gain direct benefit from the development of a solution, and the new product helps lead users to solve a personal problem (Wecht, 2006, p. 18). Lead users are selected and hired on a professional level in order to work as a team member in the product development activities (Eckehard, 2009, p. 40).

However, the integration of lead users bears the risk of becoming dependent on them on the one hand, and the risk of developing a niche product that is only of personal interest to lead user and not for the developing company itself on the other (Eckehard, 2009, p. 90).

6.3.2 The Role “Customer as a Developer”

Apart from the role of ‘customer as a resource’, customers can also act as product developers or designers. More specifically, the role ‘customer as a developer’ is described as the integration of customers into the innovation process as well as the subsequent development process, as an idea provider, a stimulator, a product designer or a solution provider (Wecht, 2006, p. 144). The areas of activity typically include participation in product specification meetings or in decision meetings, as they can be found in the stage-gate process (see chapter 3.2.1 for more detailed information about the stage-gate process). During the product specification meeting, customers can lend support for various product development tasks, like the design of the product architecture, the design of the look and feel or the definition of interfaces.

Furthermore, customers can play an essential role in the design of product features or in the evaluation of product appearance.

6.3.3 The Role "Customer as a User"

Finally, the last, but probably one of the most important roles a customer can take on in the innovation process, is the role as a user. Being one of the first to use the product puts a customer in the important role of a product tester, a so-called beta tester. That way, the producing company can reduce costs and efforts of internal testing routines. Only by later integrating customers into product test can possible product weaknesses be made transparent. The information gained can be used to increase a product's quality before the product is launched officially on the market. Especially in the area of software development and mobile app development, customers can also act as testers for product usability. Furthermore, customers can be used to evaluate the app design and its intuitiveness. Motivating customers to support as product testers yield the additional advantage that a product or service can be tested for the first time under real conditions. Moreover, a company can gain important insights into the acceptance of a product on the market and use product testers, i.e. customers, as marketing instruments.

A recommendation for smartphone app development is to integrate customers as beta testers throughout the entire product development process on the one hand, but also during the innovation process in order to evaluate and test the product concept on the other.

6.3.4 Challenges of Implementing Customer Roles

Nevertheless, there are also some challenges that arise from integrating customers into an innovation or development process. The first action is the proper selection of customers. The challenge here is to find motivated customers who are willing to support the company, while keeping a close eye on the costs. Although by customers' integration internal development and testing effort can be reduced, the overall cost of integrating customers are typically higher compared to self-developing strategies. This effect is caused by an additional effort a company has to make in order to select appropriate customers, to keep them motivated and inspired. Especially by integrating customers in the form of lead-users, the risk of developing a niche product is high. In addition, administration effort and communication effort of customer integration are much higher. Thus, customer integration needs to be planned in great detail in order to achieve the desired results (Wecht, 2006, p. 146).

6.3.5 Summary

The following section of this thesis summarizes the key roles customers can take on in the innovation or product development process. Therefore, the table below presents the three described customer roles' characteristics and customer contributions.

	Customer as a Resource	Customer as a Developer	Customer as a User
Characteristics	➢ Customer seen as source of new information	➢ Customer contributes during produced design and development	➢ Customer used as tester for prototypes and products
Customer Contribution	➢ Customer needs and ideas ➢ Innovation spirit and creativity	➢ Product solutions and decision making ➢ Development competence	➢ Product test feedback ➢ Competency as a product tester

Table 4 Summary of the different roles of customers and description of their characteristics (Wecht, 2006, p. 147).

Given the fact that this thesis focuses on the early innovation phase, the role of 'customer as a resource' is of great importance. The roles of 'customer as a developer' and 'customer as a user' are of equal importance, but only come into play in more advanced stages of product development and will therefore not be discussed further. In order to ensure proper integration of customers as a resource, the described integration of lead-users is the recommended strategy.

The following figure illustrates the assignment of customer roles to the overall integration strategy.

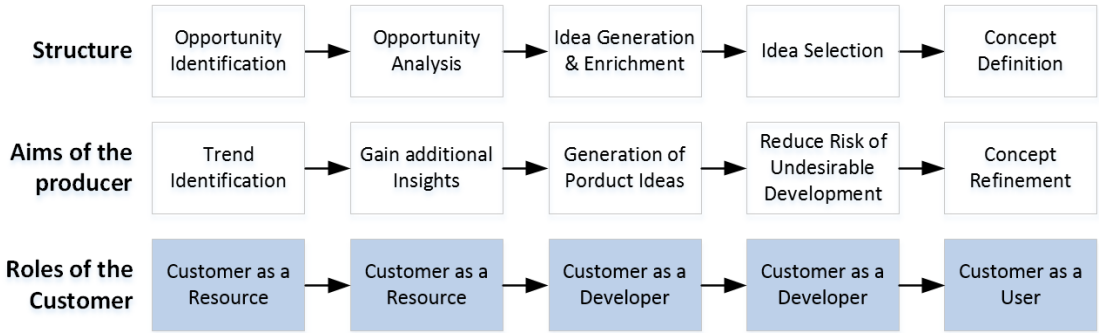

Fig. 28 Roles of a customer linked to the different stages of the NCD-model (own illustration).

6.4 Competencies of the Customer

Customers need to fulfil a specific set of requirements in order to produce the expected value for the company. These requirements typically include two types of knowledge. First, knowledge about the market and, second, knowledge about the technology. The customer is expected to have both (Wecht, 2006, p. 150).

Knowledge about the market can be separated into two parts, application related market knowledge and opportunity related market knowledge (Wecht, 2006, p. 151).

Knowledge about the technology again can be separated into two fields. First, knowledge about the core competence of the company and, second, knowledge about a contrary field (Wecht, 2006, p. 152).

Application related market knowledge describes knowledge of a user who is integrated into the early development process of a project. Due to the fact that during the early development process no finalized prototypes are available, these customers need a strong understanding of what the product should look like when finished. Furthermore, they need to be able to provide qualified feedback on the concept and need to actively work on the improvement of the product concept (Wecht, 2006, p. 151).

Opportunity related market knowledge describes the ability of customers to foresee future trends and developments on the market. In other words, these customers need to have the competencies of trend scouts (Wecht, 2006, p. 152).

Customers who have **knowledge about the company's core business** are usually B2B partners who work in a close relationship with the company (Wecht, 2006, p. 152). As the smartphone app is designed for end-users, the business strategy is a classical B2C. Thus, no partner company that meets these requirements exists. The gap can be filled by installing lead-users who provide knowhow about the company's core business.

Knowledge about a contrary field describes the customers' ability to complement the company's knowhow in a field other than the company's core business, like in product design or marketing (Wecht, 2006, p. 153).

The figure below illustrates the classification of the described customers according to the respective competencies and their integration into the overall customer integration strategy.

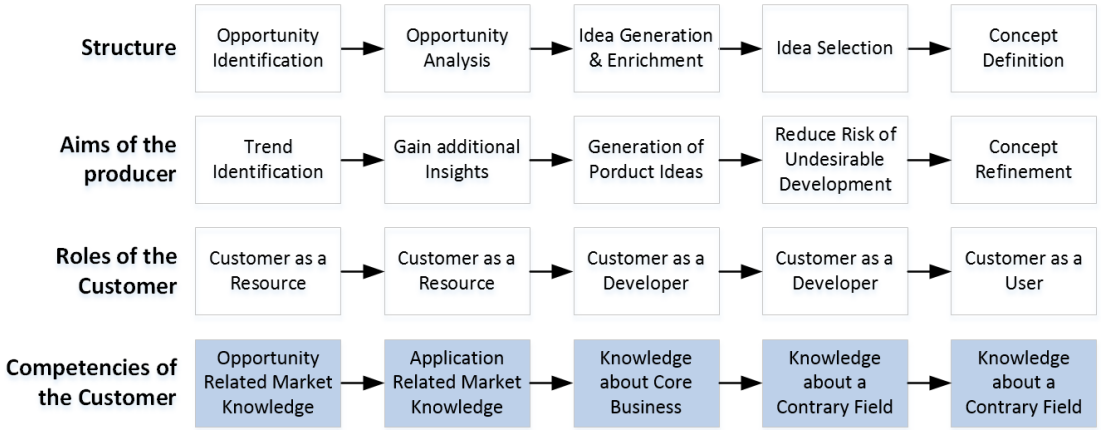

Fig. 29 Competencies of the Customer linked to the different stages of the NCD model (own illustration).

6.5 The Right Moment of Time for Customer Integration

In each of the five phases (opportunity identification, opportunity analysis, idea generation & enrichment, idea selection and concept definition), customers need to be involved in different ways, and different inputs from customers are expected at different moments. The right moment for customer integration is characterized by the phase of the innovation process.

7 SUMMARY AND OUTLOOK

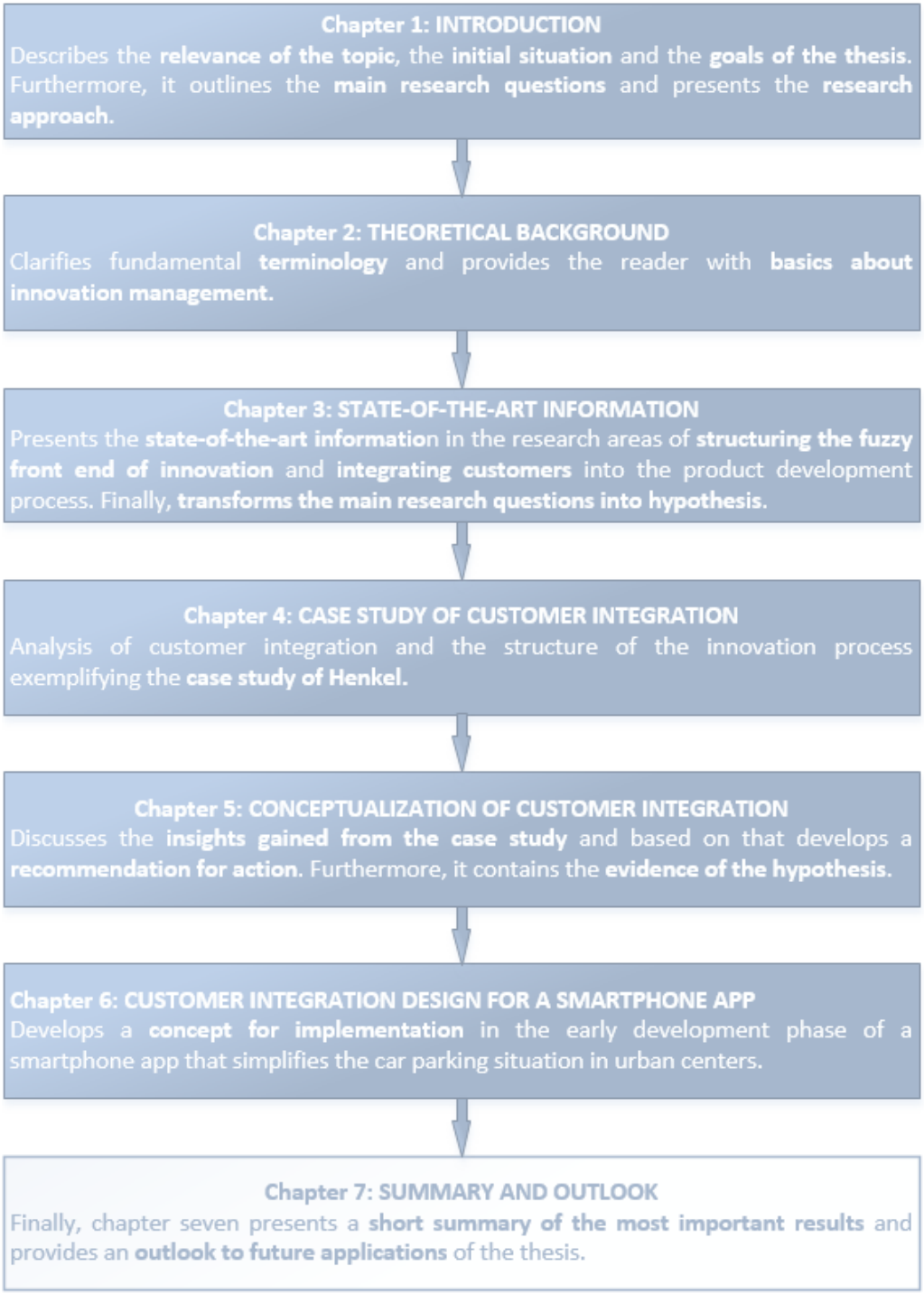

Fig. 30 Structure of the thesis

As already mentioned at the beginning, the goal of this thesis was to identify the key factors of increasing the innovation ability of a company, especially for the case of a start-up company with the goal to develop a car parking smartphone app. The first key to this innovation ability can be seen in the early phase of innovation. This phase,

also called the fuzzy front end of innovation, involves the highest leverage for product success later on. Thus, managers are strongly advised to focus on this important phase of the innovation process. The second key to this innovation ability can be found in the direct integration of customers into the innovation process.

In the course of this thesis, these two key elements of innovation success were investigated in great detail. In addition, a case study on an innovative pioneer company was carried out. The findings of the case study combined with the theoretical knowledge from the previous chapters was used to develop a concept for integrating customers into the early phase of the innovation process. Therefore, five key elements were chosen and described in detail. Those key elements can be seen as a guideline for companies to increase their innovation success.

Thus, it is likely that active customer integration into the early innovation process becomes more and more important, also for companies operating in business sectors other than mobile app development, and who are looking for possibilities to increase their innovation success as well as their corporate success.

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